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DIVISIONAL ELECTRONIC WARFARE COMBAT (DEWCOM) MODEL PROGRAMMER --ETC(U)
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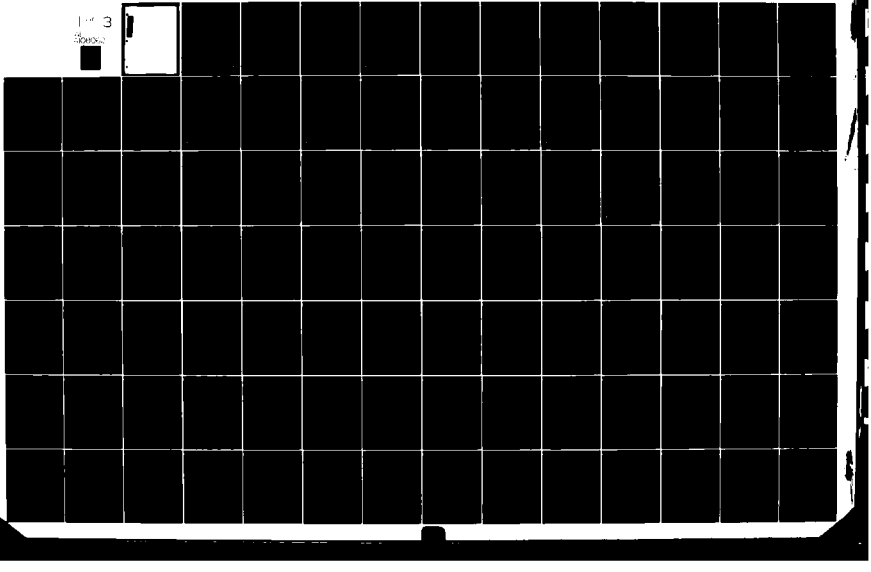

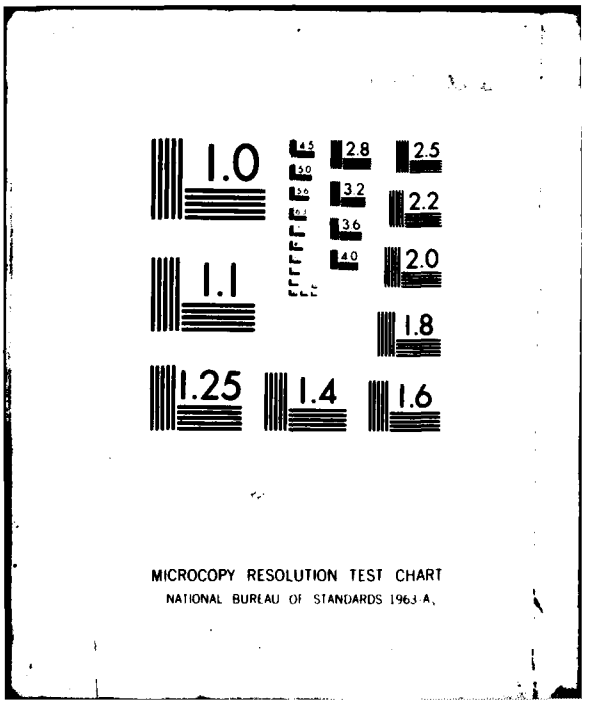
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NATIONAL BUREAU OF STANDARDS 1963-A

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: CAA-D-80-7	2. GOVT ACCESSION NO.: AD-A108062	3. RECIPIENT'S CATALOG NUMBER:
4. TITLE (and Subtitle): Divisional Electronic Warfare Combat (DEWCOM) Model Programmer Manual	5. TYPE OF REPORT & PERIOD COVERED: Final, Apr 79-Sep 80
	6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): Mr. Robert T. Campbell Mr. Ross S. Fairbrother	8. CONTRACT OR GRANT NUMBER(s): DAAK 21-79-C-0057
9. PERFORMING ORGANIZATION NAME AND ADDRESS: C.A.C.I., Inc.-Federal 1815 N. Fort Myer Drive Arlington, VA 22209	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: US Army Concepts Analysis Agency ATTN: CSCA-SMS 8120 Woodmont Ave., Bethesda, MD 20014	12. REPORT DATE: Sep 80 13. NUMBER OF PAGES: 197
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release: distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Accompanied by: Divisional Electronic Warfare Combat (DEWCOM) Model - Executive Summary-CAA Doc No. D-80-4
User Manual-CAA Doc No. D-80-5
System Manual-CAA Doc No. D-80-6

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DEWCOM Model	Electronic Countermeasures	Radar Interception
Communications-Electronics	Intelligence	Comm/EW Systems Analysis
Electronic Warfare	Command-Control	Computer Simulation
Simulation	Communications Intelligence	Tactical (COMM) EW Anal
		War Games

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This document is a manual designed to provide detailed internal information about the Divisional Electronic Warfare Combat (DEWCOM) computer simulation model, enabling an experienced programmer/analyst to maintain the model and to implement future extensions to it. The manual was prepared by C.A.C.I., Inc.-Federal under contract to the US Army Concepts Analysis Agency. The DEWCOM Model is a two-sided stochastic combat simulation model which focuses upon tactical communications and electromagnetic intelligence/threat acquisition

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systems and the electronic warfare (EW) directed against those systems. To accomplish this, the model is driven by conventional tactical engagement between a blue maneuver force against a red maneuver force. Each side consists of realistically deployed ground and close air support forces that include maneuver units, EW units, artillery units, and support units. The tactical war is driven by a set of raders that may direct units to attack, defend, move, delay or withdraw. As units begin to take tactical actions, messages are triggered which are transmitted over explicitly modeled communication links. The successful completion of these message transmissions is necessary for units to respond in the desired manner. Intelligence is gathered through direct observation of units in contact, radars, and from messages that flow between units. Increases in intelligence can in turn cause messages to be generated which may be sensed or acted upon. As messages are being transmitted over the communications facilities of one side, they are subject to being sensed by the opposing side. Several possible actions may be taken by a side upon becoming aware of the messages of the other side. The messages may be jammed, intercepted, the originator may be located, or no action at all may be taken. Intercepting a message or locating a transmitter allows an increase in the knowledge or intelligence. The model is run as a pure simulation for about 8 to 12 simulated combat hours.

DIVISIONAL ELECTRONIC WARFARE COMBAT (DEWCOM) MODEL
PROGRAMMER MANUAL
TABLE OF CONTENTS

SECTION

1.0 INTRODUCTION

1.1 Purpose of Manual

This Divisional Electronic Warfare Combat (DEWCOM) Model Programmer Manual is designed to provide detailed internal information about the DEWCOM Model Structure and programs, to enable an experienced programmer/analyst to maintain the model and to implement future extensions to it. It assumes a thorough knowledge of the computer system on which the model is to be operated, as well as experience and proficiency in using the SIMSCRIPT II.5 programming language in which the model is written. In addition to this Programmer Manual, documentation of the DEWCOM Model includes the following:

- o A DEWCOM Executive Summary, designed to provide managers with an overview of the features and capabilities of the DEWCOM Model.
- o A DEWCOM User Manual, designed to provide military and civilian analysts with the information necessary to efficiently use the model. It contains extensive detail on the preparation of input data for the model as well as instructions concerning analysis of output products.
- o A DEWCOM System Manual, designed to provide a Systems Analyst with the information necessary to operate the model on the computer.

1.2 Purpose of Model

The DEWCOM Model is a two-sided stochastic combat simulation model which focuses upon tactical communications and electromagnetic intelligence/threat acquisition systems and the electronic warfare (EW) directed against those systems. To accomplish this, the model is driven by conventional tactical engagement between a blue maneuver force against a red maneuver force. Each side consists of realistically deployed ground and close air support forces that include maneuver units, EW units, artillery units, and support units. The tactical war is driven by a set of orders that may direct units to attack, defend, move, delay, or withdraw. As units

begin to take tactical actions, messages are triggered which are transmitted over explicitly modeled communication links. The successful completion of these message transmissions is necessary for units to respond in the desired manner. Intelligence is gathered through direct observation of units in contact, radars, and from messages that flow between units. Increases in intelligence can in turn cause messages to be generated which may be sensed or acted upon. As messages are being transmitted over the communications facilities of one side, they are subject to being sensed by the opposing side. Several possible actions may be taken by a side upon becoming aware of the messages of the other side. The messages may be jammed, intercepted, the originator may be located, or no action at all may be taken. Intercepting messages or locating enemy transmitters increases a unit's level of intelligence of the opposing force. The model is run as a pure simulation for about 8 to 12 simulated combat hours.

The DEWCOM Model provides for user entry of data describing a number of factors affecting the outcome of combat, including such things as:

- Combat organization
- Communications Organization
- Equipment
- Terrain
- Orders

The model can produce two sets of reports, individually selectable by the user at run time. The first set consists of formatted listings of input data as submitted by the user, one report for each major category of data. The second set consists of results of the simulation based on the input data and the internal logic of the model. In addition, the model generates an output file from which the user can prepare ad-hoc reports as required.

2.0 THE DEWCOM MODEL

2.1 Description

2.1.1 Design Characteristics

The DEWCOM Model is designed to simulate the concepts used in tactical combat, including communications-electronics and electronic warfare (EW). The model permits the analysis of communications, radars, and EW systems. The following features are incorporated in the model:

- Provision for two-sided tactical warfare with flexibility in force structure, organization, and doctrine. Through changes in model input, essentially any mix of echelons of combat forces can be simulated (e.g., Battalion to individual items of equipment, or Corps to Company, or Echelons above Corps to Brigade/Battalion). Limiting factors to what can be represented are computer size and/or model running time; such limitations may potentially be offset by simulation of a slice of the echelons to be studied.

- Realistic message processing, with the ability to depict non-degradable and degradable communications independently for either side.

- Two terrain models, one of which is the basis for line-of-sight (LOS) calculations and the other for mobility and combat attrition routines.

- Flexible artillery algorithms which allow indirect fire artillery missions as well as direct fire missions.

- Description of weapon destructive effects and attrition as a function of target class, range, posture,

and other variables.

- o The ability to represent command and control capabilities.
- o Provision for units to change posture during the course of the battle.
- o Provision for units to have a succession of tactical objectives.
- o Unit movement and provision for interruption or changes in unit movement based on intelligence and force ratios.
- o Provision for two-sided electronic warfare functions of jamming, intercepting, and direction finding.
- o Display of radar and communications transmitters as tactical signal emitters.
- o The capability to reflect ground-to-air and air-to ground data links and jammers.
- o The capability to utilize communications intelligence.
- o Direction finding (DF), including the capability to discriminate between long and short range DF for both intelligence implications as well as artillery targeting.
- o Close air support, including rotary wing and fixed wing aircraft. Sortie attrition and failure rates are included.

- o Provision for intelligence gathering and dissemination.

2.1.2 General DEWCOM Model Structure

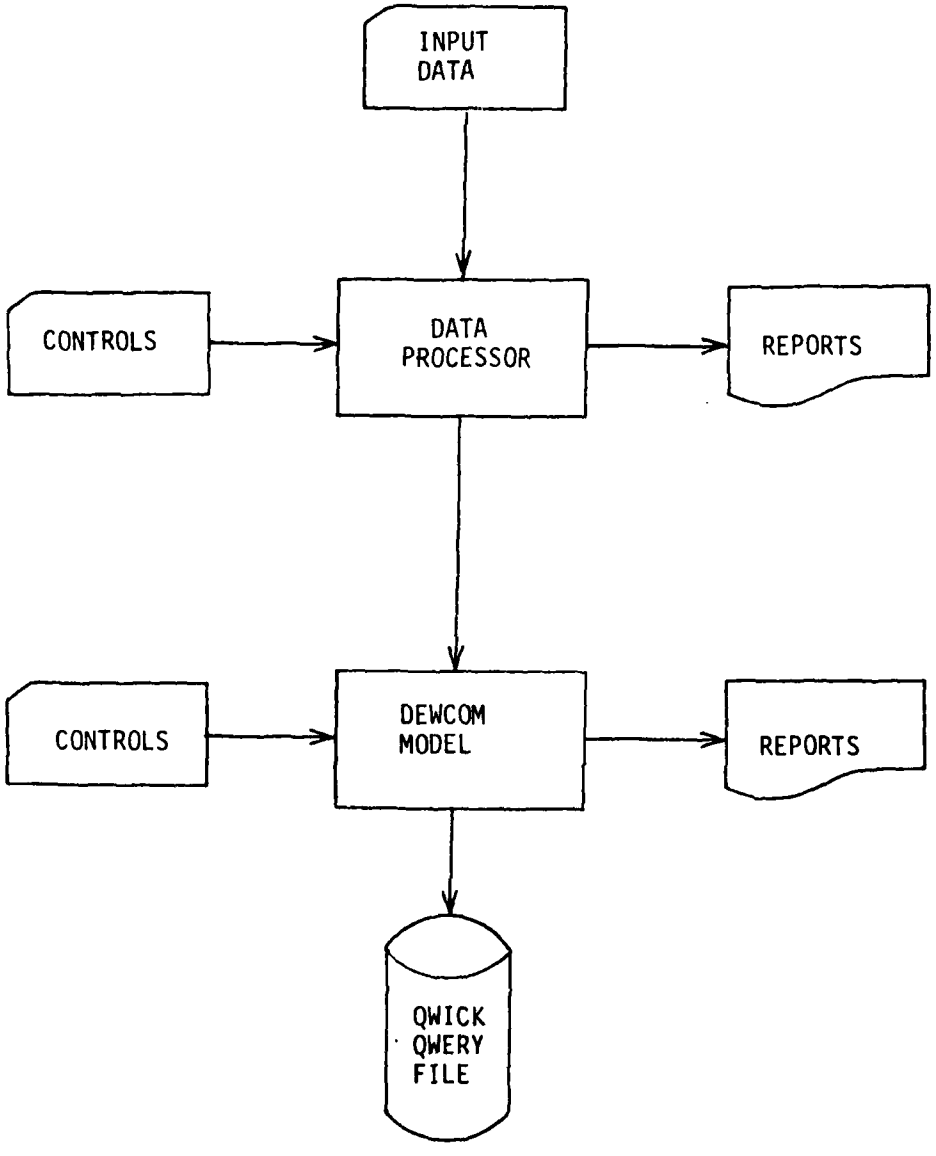
The overall DEWCOM methodology is reflected on the diagram on page 6 and consists of the following elements:

- o The input data introduced by the user, containing all the variable data concerning such factors as organization, equipment, communications, terrain, etc. to be modelled.

- o The data processor and its user-specified controls, which build the data set that drives the DEWCOM Model itself. The data processor performs certain input data verification functions by subjecting the data to reasonableness checks, builds the internal data structure from the user input, and produces reports based on the contents of the input data. The elements of the Data Processor appear on the diagram on page 7. Each READ module is a self-contained element which inputs a logical grouping of user-provided data. These modules are constructed in such a manner as to be easily substitutable to provide adaptability to alternate data input media. The current read modules include ones for Terrain, Units, Combat Organization, Communications Organization, Equipment Capabilities, Orders, and Model Controls, i.e., one for each of the major input data categories. There is a one-to-one correspondence between READ and WRITE modules.

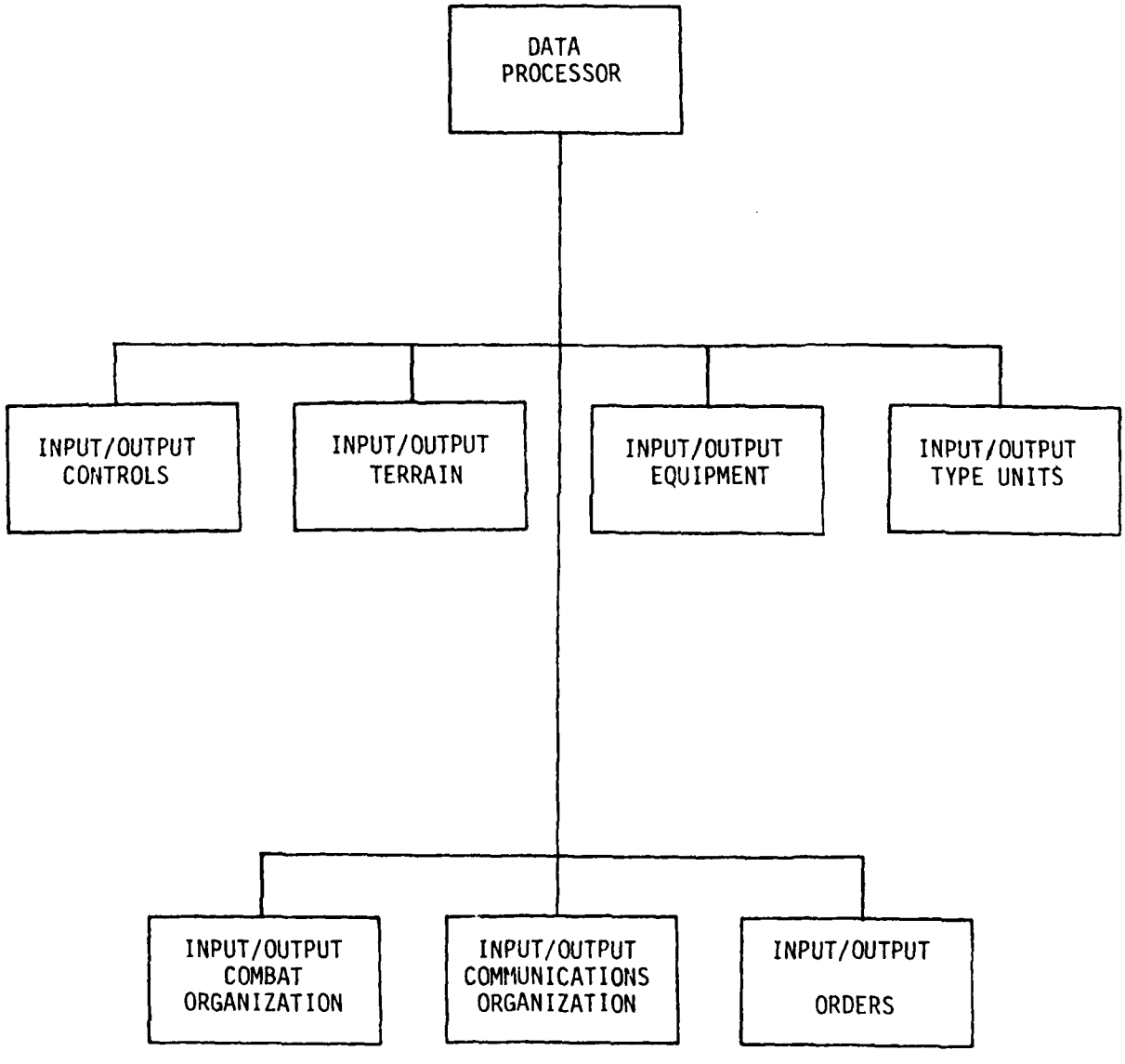
- o The DEWCOM Model itself, consisting of a large number of computer routines organized into several modules which simulate the passage of time and the multitude of interrelated processes occuring during the combat

DEWCOM
METHODOLOGY



DEWCOM

DATA PROCESSOR STRUCTURE



period. The model produces user-specified standard output reports and an output file from which the user can generate desired ad hoc reports.

2.2 Methodology

2.2.1 Modules and Their General Functions

The DEWCOM model consists of several interrelated modules, as depicted on the diagram on page 9. The major functions of each module are as follow:

2.2.1.1 The Tactical Module

- o Maneuvers units on the battleground;
- o Processes orders for each unit;
- o Fires weapons at opposing units and causes losses of personnel and equipment;
- o Causes explicit messages to be transmitted;
- o Maintains command structure;
- o Collects intelligence from sources other than radar.

2.2.1.2 The Communications Module

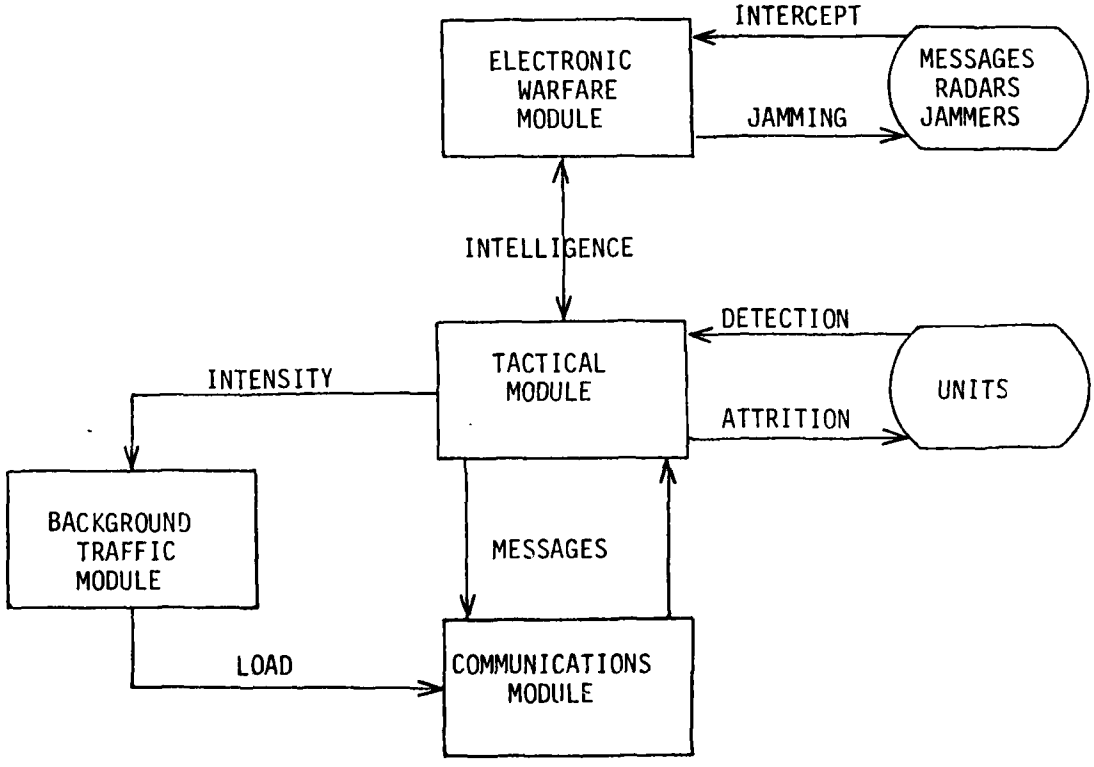
- o Processes and routes messages;
- o Maintains status of communications facilities;
- o Maintains communications structures.

2.2.1.3 The Electronic Warfare Module

- o Intercepts enemy messages and radar transmissions;
- o Performs direction finding;
- o Jams enemy communications;
- o Performs communications intelligence;

DEWCOM

MODEL STRUCTURE



- o Performs electronic intelligence.

2.2.1.4 *The Background Traffic Module*

- o Reflects message traffic implicitly;
- o Responds to tactical situations in volume of traffic.

2.2.2 How the Model Works

A main program provides central control for execution of the DEWCOM Model. The four modules mentioned above include many complex computer programs which represent specific activities or conditions occurring in the combat situation, as described below:

- o Unit Movement is controlled by tactical orders. Three types of orders (attack, move, withdraw) cause a unit to move. The unit moves until the desired distance is covered, and then it executes a new tactical order. Movement is by a distance rather than time increment. An input value controls the frequency with which a unit's position is updated.

- o Direct fire attrition is an aggregated "force on force" approach. As units are moved, they may come into contact with opposing units, causing attrition upon each other. Reduction in strength is a function of terrain, range, force ratio, and weapons. The loss of strength by a unit can cause a change in tactical orders. For example, a unit may change posture from "defend" to "withdraw". Such a change could separate the opposing forces and cause direct fire attrition to stop.

- o Indirect fire attrition is only applied when messages requesting such fire are received by the firing units. The

routing of the message is determined by input data. Units generate requests for fire; the requests are communicated to firing units; and the missions are fired.

- Close air support may be requested by message sent by units to the headquarters controlling air resources. If the message succeeds, an air mission is ordered. If the communications fail because of jamming, the close air support mission is not initiated. For missions requiring ground coordination (user input) a subsequent message must succeed between a ground station and the aircraft before attrition can be applied.

- Command and Control is simulated in terms of orders and messages. As actions occur, messages are generated (based on input data) to direct units to take actions.

- Message processing is one of the most complex tasks performed by the model. This task takes the messages that are generated and routes them to the destination via links and nets defined by the input data. Message processing includes the delays that may occur for encrypting and decrypting, as well as those encountered when all available links are busy.

- Electronic Warfare (EW) actions (direction finding, jamming, and interception) are all directed by a set of EW orders described by input data. Direction finding and intercepting result in an increase in intelligence about the opposing side. Jamming results in the enemy being denied use of communications resources.

- Intelligence collection becomes the basis for many decisions in the model. Intelligence is gathered directly by units in contact with one another, direction finding, message intercepting, and radar. It is gathered indirectly

from messages that flow between units. Artillery fire can be ordered as a result of increased intelligence, and attrition on one side changes in accordance with the amount of knowledge about that side by the opposing side.

- Implicit message functions are modelled since it is virtually impossible (and in most cases, not desirable) to model every individual message that is transmitted among the units in the simulation. The delay time encountered by messages in the communications system may be increased as the amount of tactical activity increases to model implicit messages.

- Radar of two kinds is simulated in the model: counterbattery and detection. Counterbattery radar reacts to artillery fire and can gain intelligence about the firing unit. The detection radar gathers intelligence about the opposing units within range and line of sight.

- Terrain is taken into account by the use of two terrain models. The first describes each grid square of the terrain with parameters affecting movement rates. The second (STAR terrain model) determines the presence of optical line of sight between any two points on the battlefield. This routine is employed for direct fire combat to determine if units can engage opposing units. The routine is also employed to determine radio line of sight. The signal loss for electronic transmission is based on the existence (or absence) of visual line of sight.

2.2.3 Model Operating Features

The model can be stopped, have data changed, and be restarted at the point it stopped. This allows the flexibility of changing tactics in the middle of a battle. It also allows the data that describes weapon performance to be changed. The change of tac-

tics might be employed to model a commander declaring radio silence at some time. The change of the weapons data could be used to model a change in the environment such as the employment of smoke.

2.3 Processing Environment

2.3.1 Hardware

The DEWCOM Model is designed to be relatively machine-independent, able to be operated on any large scale computer system with the required software. A typical simulation run is expected to require between 300K and 500K characters of memory, or an equivalent amount on a word-oriented system. Memory (and time) requirements are highly dependent on the specific simulation being run. Data may be input using a terminal, card reader, or equivalent device. Most output is designed to be printed using a standard high speed printer. Otherwise, no special input or output equipment is required.

2.3.2 Software

The principal software requirements are a current SIMSCRIPT II.5 compiler and the QWICK QWERY retrieval and report generation package. SIMSCRIPT II.5 compilers and QWICK QWERY are currently available for the following systems:

- o IBM 360/370
- o UNIVAC 1100
- o CDC 6000/7000
- o HONEYWELL 600/6000
- o DEC PDP 11

2.3.3 Data Base

The DEWCOM data base consists of the specific input data generated and input by the user. Special forms have been designed to

simplify the coding of the data for input to the model. These are described and discussed in the next section. While it is possible for the user to generated new input data for each run of the model, for practical reasons it is anticipated that the user will establish one basic data base, and make changes and refinements to it for each different simulation to be run. The data may be stored on an external medium such as cards or tape, but in most instances it is expected that it will be maintained on a direct access device such as a removable disk pack.

3.0 DESCRIPTION OF INPUT

3.1 General Description

The DEWCOM Model is driven by data supplied by the user, describing the characteristics and conditions of the forces involved in the simulated combat. The input data use English-like keywords, making them more meaningful and manageable when being prepared, modified, and verified. The data are structured for minimal repetition. For example, it is necessary to enter the characteristics of a radio only once rather than for every unit that has one. Built into the model are verification checks which look for "reasonableness" of the data. For example, probability values should be in the range of zero to one. The model does not stop when an "out of bounds" value occurs, but issues a warning notice to the user and continues.

3.2 User Control

The control available to the user of the DEWCOM Model is detailed, since the data to run the model is input rather than imbedded in the code. This control ranges from the selection of the data to run the model to the selection of reports to be generated from the model. User ability to direct the forces for either side through input is extremely flexible. The following sections provide a description of the data to operate the model.

3.3 Input Data Organization

Input data are organized into the following major categories:

- Controls
- Terrain
- Equipment
- Type Units
- Combat Organization

- o Communications Organization
- o Orders

The first category (Controls) is concerned with the general overall operation of the model. Through it, the user identifies reports to be produced from the simulation, lists variables which do not apply exclusively to one side or the other, and otherwise establishes the general parameters for a particular "run" of the model.

The remaining six categories describe specific characteristics, capabilities, and conditions of the opposing forces being modelled, such as units, weapons, organization, combat posture, tactics, etc. and the terrain on which the simulated combat takes place. The basic building block for the forces in the model is the unit. Each unit is given a data structure so that any unit found in military organizations can be described. In this manner, it is possible to describe forces to the resolution of platoons, companies, or battalions. Units are organized in a "tree" structure to allow complete freedom in describing the command structure.

3.4 *Input Data Conventions*

Unless otherwise specified, all seven categories of data are required for operation of the model, and they must be input in the sequence shown in the preceding paragraph (i.e., Controls, Terrain, Equipment, Type Units, Combat Organizations, Communications Organization, and Orders). The following rules or conventions govern the input data:

- o Major categories and subcategories of data are preceded by an appropriate identifying keyword and are terminated by the keyword "HALT". All keywords shown in these instructions (and the terminating keyword "HALT") must be included in the input stream, even if no data for a particular category or subcategory is being input for a given run.

- o Although the SIMSCRIPT free-form "read" statement is used in this model, allowing considerable latitude in the for-

matting of input data, the specific formats and spacing shown in the instructions in the User Manual are strongly recommended in order to more clearly illustrate the data structure and relationships.

- When a zero value for a variable or field is intended, the zero (Ø) must be explicitly input (as opposed to leaving the field blank).

- Unless otherwise stated, numeric data should be right-justified in a field (with leading blanks, if appropriate) and alphabetic data should be left-justified (with trailing blanks).

- Since input may be through punch cards as well as other media, each line (may also be referred to as a record) is limited to 80 characters of data (including blanks).

3.5 Input Data Preparation Forms

Special forms have been designed to simplify the coding of data for input to the DEWCOM Model. Roman numerals are used to identify the order of major data categories (Controls, Terrain, Equipment, etc.) while Arabic numerals reflect the sequence of forms within a major category. Subcategories of data contained on a given form are listed adjacent to the sequence number. The numbering of forms by and within major data category permit them to be readily maintained in the proper entry sequence. Where necessary, multiple copies of a specific form can be used by lining out inapplicable key words and data fields. Details are contained in the instructions relating to each specific form in the User Manual.

The DEWCOM Model input data preparation forms are listed below. Each item identifies one specific form with its major data category (shown in all capital letters following a Roman numeral), its sequence within major category (Arabic numeral under major category), and data subcategories for which it is used (following Arabic numeral).

- I. CONTROLS
  1. Global Variables Data
     Reports

- I. CONTROLS
  2. Side Attribute Data

- II. TERRAIN
  1. Mobility Data

- II. TERRAIN
  2. Obstacle Data

- II. TERRAIN
  3. Base Height Data

- II. TERRAIN
  4. Hills Data

- II. TERRAIN
  5. Hill List Data

- II. TERRAIN
  6. Covers Data

- III. EQUIPMENT
  1. Damage Class Data
     Communications Equipment Data

- III. EQUIPMENT
  2. EW Equipment Data

- III. EQUIPMENT
  3. Weapons Data

- III. EQUIPMENT
  4. Type Sortie Data

- IV. TYPE UNITS
  1. Unit Attribute Data
     Communications Equipment Owned Data

- IV. TYPE UNITS
  2. EW Equipment Owned Data
     Weapons Owned Data

- IV. TYPE UNITS
  3. Attrition Data
     Desirability of Firing Data
     Sector Width Data
     Performance Degradation Factor Data

- V. COMBAT ORGANIZATION
  1. Units Data

- V. COMBAT ORGANIZATION
  2. Air Sortie Data

- VI. COMMUNICATIONS ORGANIZATION
  1. Nets and Links

- VI. COMMUNICATIONS ORGANIZATION
  2. Compound Links

- VII. ORDERS
  1. Communications Orders

- VII. ORDERS
  2. EW Orders

- VII. ORDERS
  3. Tactical Orders

o VII. ORDERS

4. Posture

3.6 Input Data Preparation Instructions

Detailed instructions for completion of each of the input data preparation forms are contained in the DEWCOM User Manual and will not be repeated here. A foldout of a completed sample of each form is contained in that document following each subparagraph containing instructions governing its data fields.

All required key words are preprinted in bold block letters in the appropriate columns of each form. Key words are shown in their proper relationship to other key words and data fields. These relationships must be maintained in the input data stream.

In some instances, brief instructions for entries in the fields are contained on the form itself, adjacent to the space for the data. Areas of each form which are not to be used for data are shaded.

Where deemed necessary, a reference number or "key" is used to relate data fields on the form to the specific associated instructions. Key numbers are encircled and shown over or adjacent to a specific field, or preceeding a line on the form.

The general format for detailed instructions is as follows:

Key:	(When applicable; an Arabic numeral.)
Name:	(The internal DEWCOM Model name for the data field or variable; all capital letters separated by dots, if appropriate; no embedded blank spaces.)
Spaces:	(The maximum number of characters of data which may be entered.)
Columns:	(The horizontally numbered spaces on the form in which the data are entered.)

Entries: (When applicable; a listing of the entries of type(s) of entries permitted or required in the field.)

Description: (When necessary; an explanation of the data field or variable, significance of entries, restrictions, etc.)

4.0 DESCRIPTION OF OUTPUT

The output products available from the DEWCOM Model are divided into three major categories:

- o Input Data Reports
- o Model Reports
- o Ad Hoc Reports

The generation of any or all of the available reports is at the option and under control of the user.

4.1 Input Data Reports

This group of reports provides the user with formatted listings reflecting actual data which was input to the model for the current run. The full simulation need not be run in order to produce these reports. In fact, one of their major uses is to permit a review of the input data for errors or omissions before a lengthy and costly simulation run is actually made.

The production of the Input Data Reports is controlled by the user at input time through entries in the REPORTS DATA section of DEWCOM Input Data Prepartion Form I.1 (CONTROLS; Global Variables Data, Reports Data). Each Input Data Report number (1 through 7) entered in the appropriate blank spaces on Form I.1 results in the printing of a formatted report of the input data in the corresponding major category. The Input Data Reports are as follow:

Report #	Major Data Category
D1	CONTROLS
D2	TERRAIN
D3	EQUIPMENT
D4	TYPE UNITS
D5	COMBAT ORGANIZATION

D6 COMMUNICATIONS ORGANIZATION

D7 ORDERS

Because of the amount of data in various major input categories, some reports are printed in several parts, with related portions of the input data on each part. When a major category report is requested, all parts of that particular report are produced. The individual reports and their content are explained in the following subsections and a sample of each report format is included in Appendix D. The entire report is not printed in all cases due to the volume of data.

4.1.1 Report D1 reflects CONTROLS data input on Forms I.1 and I.2, including the following:

- o Whether or not the simulation is to be started
- o Identification numbers of the Data and Model reports which are to be printed
- o Attributes of Blue and Red sides
- o Global Variables.

4.1.2 Report D2 reflects TERRAIN data and is divided into 7 parts as follows:

4.1.2.1 Report D2A reflects mobility data input on Form II.1, including the following:

- o X and Y coordinates of origin
- o Size of each grid square
- o Number of grid squares in the simulation
- o Mobility indices of all grid squares in the simulation identified in terms of their X and Y offsets from the origin.

4.1.2.2 Report D2B reflects obstacle data input on Form II.2, including:

- o X and Y grid coordinates of origin

- o Size of each grid square
- o Number of grid squares in the simulation
- o Obstacle indices of all grid squares in the simulation identified in terms of their X and Y offsets from the origin.

4.1.2.3 Report D2C reflects base altitude data input on Form II.3, including:

- o X and Y grid coordinates of origin
- o Size of each grid square
- o Number of grid sqares in the simulation
- o Base altitude of each grid square

4.1.2.4 Report D2D reflects hill data input on Form II.4, including:

- o X and Y grid coordinates of origin
- o Size of each grid square
- o Number of grid squares in the simulation
- o For each hill,
  - Hill ID
  - X and Y grid coordinates of the center
  - Peak height in meters
  - Orientation angle in degress from east
  - Eccentricity of the hill mass
  - Spread of the hill mass
  - Height of normal curve describing this hill
  - Cut

4.1.2.5 Report D2E contains hill summary data, input on Form II.5, including:

- o X and Y grid coordinates of origin
- o Size of each grid square
- o Number of grid squares in the simulation
- o ID numbers of all hills appearing in each grid square

4.1.2.6 Report D2F contains covers data input on Form II.6, including:

- o X and Y grid coordinates of origin
- o Size of each grid square
- o Number of grid squares in the simulation
- o For each cover,
  - Cover ID
  - X and Y grid coordinates of the center
  - Height in meters
  - Orientation angle in degrees from east of an ellipse representing the cover
  - Length of the major axis of the ellipse in meters
  - Length of the minor axis of the ellipse

4.1.2.7 Report D2G contains covers summary data from Form II.6, including:

- o X and Y grid coordinates of origin
- o Size of each grid square
- o Number of grid squares in the simulation
- o ID number of all covers appearing in each grid square

4.1.3 Report D3 reflects EQUIPMENT data and is divided into 5 parts as follows:

4.1.3.1 Report D3A reflects Equipment Damage Class data input on Form III.1. It includes the damage class value input for each class.

4.1.3.2 Report D3B has a separate portion for each side (Blue and Red) and reflects Communications Equipment data input on Form III.1. For each item of communications equipment, the following information is included:

- o Name
- o Class
- o Damage class
- o Mean time between failures
- o Mean time to repair
- o Range
- o Jamming awareness.

4.1.3.3 Report D3C has a separate portion for each side and reflects Electronic Warfare (EW) equipment input on Form III.2. For each named item of EW equipment, the following information is included:

- o Name
- o Class
- o Damage class
- o Mean time between failures (hours)
- o Mean time to repair (hours)
- o Range in meters
- o DF time in seconds
- o Intelligence rate
- o High limit of frequency range at which effective

- o Low limit of frequency range at which effective
- o Radar transmission/return duration
- o Radar interval between transmissions

4.1.3.4 Report D3D has a separate portion for each side and reflects Weapons data input on Form III.3. For each weapon listed, the following information is included:

- o Name
- o Combat value
- o Damage class
- o Range
- o Attrition class
- o Terrain effect

4.1.3.5 Report D3E has a separate portion for each side and reflects air sortie data input on Form III.4. For each type air sortie, the following information is included:

- o Name
- o Class
- o Ground coordination requirement
- o Transit time
- o Loiter time
- o Effectiveness
- o Transit attrition rate
- o Loiter attrition rate
- o Renewal time

4.1.4 Report D4 reflects TYPE UNITS data and is divided into 5 parts and follows:

4.1.4.1 Report D4A reflects type units separately by side, along with their attributes, as input on Form IV.1. For each type unit, the following information is included:

- o Name
- o Class
- o Alternate CP existence
- o Move Rate
- o Radius
- o Intelligence fade rate
- o Maximum encryption capability
- o Encryption factor
- o Suppression factor
- o Duration of suppression
- o Artillery duration
- o Artillery interval
- o Communications setup time
- o Communications teardown time
- o EW equipment setup time
- o EW equipment teardown time
- o Tactical setup time
- o Tactical teardown time
- o EW priority
- o IF priority

4.1.4.2 Report D4B is an equipment listing for each type unit, and contains a separate portion for each side. It reflects data input on Forms IV.1 and IV.2 and includes, for each type unit:

- o Type unit name
- o Name and quantity of each item of communications equipment
- o Name and quantity of each item of EW equipment

- o Name and quantity of each type weapon

4.1.4.3 Report D4C lists attrition rates for each type of unit separately by side as input on Form IV.3. It includes type unit, attrition class, and percent attrition rates per combat day under a variety of force ratio ranges as well as for a non-combat situation.

4.1.4.4 Report D4D reflects the desirability of firing each type weapon of the opposing side at each type unit class. A separate portion is produced for each side, and the information corresponds to that input on Form IV.3.

4.1.4.5 Report D4E reflects performance degradation and sector width information separately for each side, as input of Form IV.3. A performance degradation factor is shown for each type unit class for each combat posture for various levels of cumulative attrition.

4.1.5 Report D5 reflects unit COMBAT ORGANIZATION data for each side, and contains information input on Forms V.1, V.2, and VI.1. Within each side, it provides the following for each unit:

- o Unit ID
- o Unit name
- o Type unit
- o X and Y grid coordinates of location
- o Superior unit ID
- o Unit IDs of subordinate units
- o Communications link IDs
- o Air sorties by type and number.

4.1.6 Report D6 reflects COMMUNICATIONS ORGANIZATION data and is divided into 2 parts as follows:

4.1.6.1 Report D6A reflects communications nets and links separately for each side, as input on Form VI.1. For each communications net, the following information is included:

- o Type
- o Model
- o Security
- o Usage
- o Continuous carrier indication
- o Primary and secondary frequencies
- o Each link in the net, including
  - Link ID
  - Unit IDs of each end
  - Type equipment at each end
  - Whether one or two way
  - Desirability of use
  - Conversion time
  - Number of channels
  - Convertability
  - Switchability
  - Jammability
  - Compound link indicator

4.1.6.2 Report D6B reflects data for compound links, separately by side, as input on Form VI.2. It includes the Net ID, the identity of each compound link in the net, and the ID of every unit in the compound link.

4.1.7 Reflect D7 reflects ORDERS data and is divided into 4 parts as follows:

4.1.7.1 Report D7A reflects communications orders for each originating unit separately by side, as input on Form VII.1. It identifies the type unit of the origin, and for each, the following information for each order:

- o Destination
- o Stimulus for transmission of the order
- o Mode
- o Precedence
- o Threshold for transmission
- o Length
- o Intelligence value
- o Action to be taken based on message
- o Usage
- o Security
- o Deadline action
- o Frequency of transmission
- o Processing time
- o Deadline time

4.1.7.2 Report D7-B lists EW order information separately by side, as input on Form VII.2. For each type of opposing net against which the EW order is to be executed, the following are included:

- o Minimum range for execution
- o Maximum range for execution
- o Duration
- o The preferable EW function to be performed
- o The function to be carried out in the event the preferable one cannot be carried out

4.1.7.3 Report D7-C lists tactical orders separately by side, as inupt on Form VII.3. for each unit on the side, the following are reflected:

- o Unit ID and name
- o Active order
- o For each combat posture order,
  - Range
  - Azimuth (direction)
  - Duration
  - Strength threshold for failure order
  - Attack force ratio
  - Failure force ratio
  - Failure order
  - Success order

4.1.7.4 Report D7-D lists the combat postures for both sides and, for each posture, the following:

- o Effectiveness
- o Strength threshold for order change
- o A multiplier to modify time duration

4.2 Model Reports

This group of reports provides the user with the status of various model factors reflecting the effects of the simulation. The reports reflect the model status at the beginning of the simulation, at intervals specified by the user at input time and at normal termination of the simulation.

Production of the Model Reports is controlled by the user at input time through entries in the REPORTS DATA section of DEWCOM Input Data Preparation Form I.1 (CONTROLS; Global Variables Data, Reports Data). Each Model Report number (1 through 7) entered in the appropriate blank spaces on Form I.1 results in the printing of a corresponding report, as follows:

Report #	Title
M1	Unit Status
M2	Link Status
M3	Message Status
M4	Attrition Summary
M5	EW Status
M6	Equipment Status
M7	Intelligence Logs

The desired reports are produced at the interval specified by the user in the "REPORT.FREQUENCY" entry (Key #14) on Form I.1, and the simulated time is reflected on each. The Model Reports are explained in the following subsections, and a sample of each report format is included in Appendix E.

4.2.1 Report M1 (Unit Status) reflects status of all units on a side with a separate part produced for each side. For each unit, the following information is listed:

- o Unit ID and name
- o Type unit
- o X and Y grid coordinates of location
- o Strength
- o Force ratio
- o Artillery status
- o Active tactical orders
- o Number of units in contact list
- o Number of units in indirect fire target list
- o Number of messages in message list

4.2.2 Report M2 (Link Status) is produced separately for each side, and reflects the status of all communications links. The report includes the following information for each net on a side:

- o Net ID
- o Communications frequency (megahertz) in use
- o ID of each link in the net, along with the following:

- Unit ID of each end of the link
- Link status
- Number of channels available and in use

4.2.3 Report M3 (Message Status) is produced separately for each side and reflects the status of all messages. The report includes the delay time affecting all messages due to the volume of message traffic, as well as the following:

- o ID of communications order
- o Originating Unit ID
- o Transmitting Unit ID
- o Destination ID
- o Status
- o Usage
- o Mode
- o Message length
- o Minutes to deadline time

4.2.4 Report M4 (Attrition Summary) is produced separately for each side. It reflects the following information concerning each item of equipment within equipment type:

- o Equipment name
- o Original quantity
- o Quantity destroyed
- o Quantity remaining
- o % remaining
- o Killed by direct fire
- o Killed by indirect fire
- o Killed by close air support

4.2.5 Report M5 (EW Status) consists of two parts, Actions in Progress and Awaiting Action. Each part is produced separately for each side, and contains the following information:

4.2.5.1 EW Status - Actions in Progress.

- o Unit ID
- o Action
- o Opposing side target Unit IDs

4.2.5.2 EW Status - Awaiting Action.

- o IDs of opposing side units awaiting EW action
- o Message ID
- o Priority

4.2.6 Report M6 (Equipment Status) consists of three parts, Communications Equipment, EW Equipment, and Weapons. Each part is produced separately for each side, and contain the following information for each unit:

- o Unit ID and Unit Name
- o For each equipment name within type, the original quantity and the quantity currently remaining.

4.2.7 Report M7 (Intelligence Log) is produced separately for each side. It reflects the ID of each unit on a side which has intelligence information relating to opposing side units. Entries include the ID of the opposing side units about whom intelligence information is possessed, and the value of the information.

4.3 Ad Hoc Reports

Recognizing that all report requirements cannot be foreseen in advance of development of a system, provision is made for special or one-time reports to be produced from the DEWCOM Model through the use of the QWICK QWERY system.

The QWICK QWERY data analysis and report generation system was created to allow managers and programmers to selectively access and display information from existing data files. It reduces the costs and

delays associated with problem definition, system analysis, and the coding, testing, modification, and debugging of special purpose programs. QWICK QWERY provides the means for timely retrieval and display of existing but frequently inaccessible information, satisfying the following requirements:

- o It allows the rapid generation of ad hoc reports without much of the usual programming delays.

- o It is a powerful report design tool. Difference report formats, sorting sequences, attribute selections, and subtotals can be conveniently tried until the desired report is produced.

- o It allows report requests to be made directly by the end user, avoiding the frequent miscommunications concerning what exactly is needed or desired.

The QWICK QWERY system provides the DEWCOM military analyst with a very powerful and convenient analysis and report generation capability. User convenience is attained through three simple report and request forms. Form 1 provides for the selection of specific data items from a record and specific records from a file. It also provides for sorting and subtotal calculation. Form 2 is used when new data items are to be computed as a function of existing data items. It also provides the capability to do selective counting and indexing. Form 3 provides the option of conveniently laying out the generated report in the desired format. A blank copy of each of the forms is contained in the Divisional Electronic Warfare Combat (DEWCOM) Model User Manual, CAA Doc #D-80-5.

The DEWCOM model writes the transaction file which must be accessed by the QWICK QWERY System to produce the necessary reports.

5.0 PROGRAMMING DETAIL

5.1 Programming Conventions

The following programming conventions and standards are to be used to ensure consistent structured code in all modules.

5.1.1 General Structure and Indentation

To improve readability, source code should be indented to show the logical structure of the code. Names and labels should be chosen in a way that is descriptive of what is occurring. Whenever possible, code only one statement per line.

- Start statements in columns 1, 10, 15, 20, 25, 30, 35, 40, 45, and 50. Begin headings "PREAMBLE" and all "ROUTINE" declarations in column 1. Code terminator for these sections in column 1 also. Code GIVEN and YIELDING arguments each on a separate line, starting in column 10.

- To help associate a terminator with its section, include the section name in its terminator. For example:

```
PREAMBLE        ROUTINE RADIO.VISIBILITY
ENDPREAMBLE     ENDROUTINE
```

- Statement labels should occupy a separate line. To make them stand out, always begin labels in column 1.

- If a statement cannot be contained on one line, indent additional lines 5 spaces.

- Do not break a line within a keyword or name.

- Do not extend code beyond column 72.

- In the preamble, begin subsection headers "PERMANENT ENTITIES", "TEMPORARY ENTITIES", and "EVENT NOTICES" in column 10. Within each, start the major definition statement in column 15 and the definition of attributes of entities (or parameters of events) in column 20.

- Begin attribute definition statements in column 15.

- Begin definitions of sets, routines, simple variables, "define to mean" statements, and data collection directives in column 10.

- Begin the first statement in a routine or event (other than the routine specification itself) in column 10.

- Code "FOR" loops in such a way that the statements controlled by the "FOR" are indented one level. Complex "FOR" statements requiring more than one line should be indented if control clauses are present.

- Code "FOR" loops which search for the first case as follows:

```
10   15
FOR EACH UNIT
     WITH MI.AWAY(I)   0,
FIND THE FIRST CASE
IF FOUND
ELSE
ALWAYS
```

In this example, the clauses "FIND THE FIRST CASE" and "IF FOUND" are on the same level as the "FOR". The contents of the "FOR" are indented, and the "ELSE" and "ALWAYS" statements are placed at the same level as the "FOR".

- o Indent nested "FOR" loops for each new nesting level.

- o Code "IF" statements with the logic treated as one statement, indenting as specified earlier. If the statement is too long for one line, indent the "true" and "false" portions of the "IF" each one level.

- o Precede blocks of code that perform a unified function with comments. To help the comments stand out, leave a blank line before and after the comments. The first word of the comment should line up with the block of code it relates to.

- o It is often desirable to comment on a specific statement to expand or explain its meaning. Where possible, begin such comments in column 45.

5.1.2 The Preamble

Definitions within a Preamble should be in the following order:

```
PERMANENT ENTITIES
TEMPORARY ENTITIES
SYSTEM VARIABLES
PROCESSES
EVENT NOTICES
REAL GLOBAL VARIABLES
INTEGER GLOBAL VARIABLES
ALPHA GLOBAL VARIABLES
ARRAYS
SETS
DATA COLLECTION DIRECTIVES
DECLARATION OF ALL RELEASABLE SIMSCRIPT ROUTINES
DECLARATION OF ALL MONITORED SIMSCRIPT ROUTINES
DEFINE TO MEAN DECLARATIVE
```

The following additional guidelines apply to the Preamble

Define mode of attributes of entities after their specification.

Declare the background mode as INTEGER, variable type as RECURSIVE, and DIMENSION as ZERO.

Pack variables if it is efficient to do so. Use field packing instead of bit packing whenever possible since less code is generated.

Use "DEFINE TO MEAN" statements to add more meaning to the body of the program. For example,

```
DEFINE ON TO MEAN 1
DEFINE OFF TO MEAN 2
```

5.1.3 Format of Routines, Processes, and Events

Each routine, process, and event should be coded in the following format:

```
ROUTINE NAME
        GIVEN arguments
        YIELDING arguments
(Follow with comments beginning in column 10 for each of the
headings listed below, indenting 5 columns thereafter)
        ''PURPOSE
        ''   (text of purpose)
        ''FUNCTION
        ''   (text of function of the routine)
        ''COMMUNICATIONS
        ''   FILES
        ''        (list names of additional files needed
        ''        for program execution, e.g., system
        ''        libraries and miscellaneous data files.
        ''        All files must be defined.)
```

```
''   ARGUMENTS
''        GIVEN
''        YIELDING
''ERRORS
''   (List error numbers associated with the names
''   of the routines that set the errors)
''ASSOCIATED PROGRAMS
''   CALLED BY
''        (names of routines calling this routine)
''   CALLS
''        (names of routines called by this routine)
(follow with code)
```

An example of a routine in the above format follows:

```
ROUTINE TO RANGE
        GIVEN
             .FIRST.UNIT,
             .SECOND.UNIT
        ''PURPOSE
        ''   THE PURPOSE OF THIS ROUTINE IS TO ACT AS A RIGHT
        ''   FUNCTION TO COMPUTE THE RANGE BETWEEN TWO UNITS
        ''FUNCTION
        ''   1.  COMPUTE THE RANGE AS THE SQUARE ROOT OF THE
                 SUM OF THE SQUARES OF THE DIFFERENCES IN THE
                 X AND Y COORDINATES.
        ''   2.  INTEGERIZE THE RESULTS.
        ''   3.  AS THE UNIT COORDINATES ARE INTEGERS TO THE
                 NEAREST 10 METERS, THE RANGE IS ALSO TO THE
                 NEAREST 10 METERS.
        ''FILES
        ''   NONE
```

```
''ERRORS
''    NONE
''ASSOCIATED PROGRAMS
''    CALLED BY
''         COUNTER.BATTERY.RADAR
''         FIRE.DIRECTION
''         JAMMER
''         MESSAGE.ACTION.AT.DEADLINE
''         MOVE.UNIT
''         NEXT.EW.ORDER
''         RADAR
''    CALLS
''         NONE
NORMALLY MODE IS INTEGER
DEFINE .DELTA.X, .DELTA.Y, .R AS REAL VARIABLES
LET .DELTA.X = REAL.F(UN.X.COORDINATE(.FIRST.UNIT)-
     UN.X.COORDINATE(.SECOND.UNIT))
LET .DELTA.Y = REAL.F(UN.Y.COORDINATE(.FIRST.UNIT)-
     UN.Y.COORDINATE(.SECOND.UNIT))
LET .R = SQRT.F(.DELTA.X**2 + .DELTA.Y**2)
RETURN WITH INT.F(.R)
ENDROUTINE
```

5.1.4 General Programming Guidelines

- Structured programming techniques should be used in designing and coding the model and changes thereto. Use of "sequence", "if then else", and "while do" constructs should form the basis for all programs.

- Overall software development should be approached as a tool-building process. Where possible, individual routines should be written as if they are to be placed on a computer system support library for the project.

- Routines that do too much or are difficult to communicate with because of a dependency on a particular data environment (e.g., heavy reliance on global variables instead of parameter lists) have little value as off-the-shelf packages.

- A functions should be used only for its returned value and nothing more, i.e., it should behave the same as in a purely mathematical environment. Functions are sometimes misused because of a failure to consider the impact on the program environment. Thus, if F(x) + F(x) does not always equal 2*F(x) because x (or a global variable) is altered, then an unwanted, difficult-to-detect side effect has been introduced.

- Subroutines differ from functions in that they can alter formal parameters or global variables. However, subroutines are not immune to side effects if heavy reliance is made on hidden globals, as opposed to the more visible parameter lists for data communication. For example, a routine that redefines a global which serves as an input global for a subsequent call, may produce unexpected results.

- Where possible, total communications with a routine should be confined to the call line only. This is in keeping with the tool building concept of program development. A routine becomes much more attractive to another user if he can pass his environment entirely through a call line. Exceptions will arise, especially at the executive level where large numbers of input variables must be made available to sub-executive routines.

- If a routine needs so much information that it makes parameter passing impractical (or impossible), it

could be that the routine is doing too much. Additional breakdown into smaller modules may be necessary. On the other hand, the routine could be so highly specialized that its usability as a general tool is very remote. Thus, a mix of globals and formal parameters can be tolerated.

- Global variable labels should be used to isolate true global variables, i.e., those variables needed by more than one routine that cannot be passed as formal parameters.

5.1.5 Other Coding Constraints

The following additional coding standards and constraints are applicable for the DEWCOM Model:

- Use the new structured "IF" statement.
- Do not use numerical statement labels.
- Use WRITE instead of PRINT statements.
- Use free-form input whenever possible.
- Release logical recursive arrays before leaving a routine.
- If the limits of a "FOR" phrase are invariant for the life of the loop, evaluate those limits prior to execution of the loop.
- Do not use the "JUMP BACK" and "JUMP AHEAD" constructs.
- Identify global variable names by an embedded or trailing period.

- Identify local variable names by a preceding period.

- Identify words which have been defined in a "DEFINE WORD TO MEAN..." statement by two preceding periods.

- To assist in debugging, do not give a value of zero (0) to indicators set by a "DEFINE WORD TO MEAN VALUE" statement. (The SIMSCRIPT compiler initialized all variable to zero. Thus, if a word has been defined to mean zero, and the variable has been set equal to word, a programmer would be unable to tell from a listing whether the value was due to the compiler, or if the variable had taken on other values and then been reset to zero by the word.)

- Do not use implied subscripts.

5.2 Variable and Program Dictionary

The following is a dictionary of variables, routines, events, and processes used in the DEWCOM Model.

NAME — DEFINITION

AIR.SORTIE

A temporary entity for storing data for air sorties for each side. It may belong to an AS.LIST. The attribute names for this entity are prefixed with "AS."

ALPHA.SETUP

A routine which establishes the values of the elements in arrays used for alpha output.

AMAJ.E

An attribute of the permanent entity CVR.ELLIPSE, identifying the length in meters of the semi-major axis of an ellipse describing cover.

AMIN.E

An attribute of the permanent entity CVR.ELLIPSE, identifying the length in meters of the semi-minor axis of an ellipse describing cover.

ANG.E

An attribute of the permanent entity CVR.ELLIPSE, identifying the orientation angle in degrees measured counter-clockwise from East to the major axis of an ellipse describing cover.

ANG.H

An attribute of the permanent entity HILL. identifying the orientation angle in degrees measured counter-clockwise from East to the major axis of an ellipse representing a horizontal cross-section of a hill.

AR.COMBAT.ATTRITION

An attribute of the temporary entity ATTRITION.RATE representing the percent attrition per combat day for a given force ratio range.

AR.SET

A set of ATTRITION.RATE entities owned by the compound entity SIDE, ATTRITION.CLASS, TYPE.UNIT.CLASS.

AR.UPPER.FORCE.RATIO

An attribute of the temporary entity ATTRITION.RATE indicating the upper limit of a force ratio range for which an attrition rate (AR.COMBAT.ATTRITION) applies.

AS.FS.QUANTITY

An attribute of the temporary entity AIR.SORTIE indicating the quantity of an AS.TYPE originally assigned.

AS.LIST

A set of AIR.SORTIE entities owned by a unit.

AS.QUANTITY

An attribute of the temporary entity AIR.SORTIE indicating the quantity of an AS.TYPE currently assigned.

AS.TYPE

An attribute of the temporary entity AIR.SORTIE reflecting the name for a type of air sortie.

ATTRITION

A routine which updates unit attrition caused by direct contact with opposing units.

ATTRITION.CLASS

A permanent entity used as an index to find a particular AR.SET.

ATTRITION.RATE

A temporary entity belonging to an AR.SET, whose attributes provide data to compute attrition. Attribute names of this entity are prefixed with "AR."

BACKGROUND.TRAFFIC

An event modifying delay times for messages.

BACKGROUND.TRAFFIC.UPDATE.TIME.

A real variable representing the interval in minutes at which message processing delays are computed.

BASE

An attribute of the permanent compound entity X.GRID, Y.GRID which indicates the base height or elevation of a particular grid square.

CALL.SPECIFIC.UNIT

A routine which sends a message to a specific recipient.

CAS.OWNING.UNIT

An attribute of the process CLOSE.AIR.SUPPORT which identifies the unit owning air sorties.

CAS.REQUESTING.UNIT

An attribute of the process CLOSE.AIR.SUPPORT which identifies the unit requesting close air support.

CAS.STATUS

An attribute of the process CLOSE.AIR.SUPPORT indicating the current status of a sortie (in transit, loitering, completed, or cancelled).

CAS.TALK

A routine which attempts to find a link between a ground controller and an air sortie if TAS.GROUND.COORDINATION has been set to "YES".

CAS.TARGET.UNIT

An attribute of the process CLOSE.AIR SUPPORT; a pointer to the opposing unit which is the target of an air sortie.

CBR.ARTILLERY.UNIT

An attribute of the process COUNTER.BATTERY.RADAR; a pointer to the opposing artillery unit which the counterbattery radar is attempting to locate.

CBR.EQUIPMENT.TYPE

An attribute of the process COUNTER.BATTERY.RADAR; a pointer to the entity EWE.TYPE reflecting the characteristics of the counter-battery radar.

CBR.TARGET.UNIT

An attribute of the process COUNTER.BATTERY.RADAR; a pointer to the unit which is the target of the opposing CBR.ARTILLERY.UNIT.

CBR.TERMINATOR

An attribute of the process COUNTER.BATTERY.RADAR indicating whether or not the process was terminated before its successful completion.

CBR.TIME.UNTIL.ATTRITION

An attribute of the process COUNTER.BATTERY.RADAR reflecting the time period before attrition of the CBR.TARGET.UNIT.

CBR.UNIT

An attribute of the process COUNTER.BATTERY.RADAR; a pointer to the unit owning the CBR.EQUIPMENT.TYPE used in the process.

CE.ATTRITION

A routine which identifies communications equipment destroyed through routine ATTRITION or processes CLOSE.AIR.SUPPORT or FIRE.MISSION.

CE.DOWN.QUANTITY

An attribute of the temporary entity COMMUNICATIONS.EQUIPMENT representing the quantity of equipment that is currently being repaired.

CE.FS.QUANTITY

An attribute of the temporary entity COMMUNICATIONS.EQUIPMENT indicating the quantity of a CE type originally assigned.

CE.IN.USE

An attribute of the temporary entity COMMUNICATIONS.EQUIPMENT indicating the quantity of a type of communications equipment in actual use.

CE.LIST

A set of COMMUNICATIONS.EQUIPMENT owned by a unit.

CE.POINTER

A temporary entity belonging to a CEP.LIST and owned by a TYPE.UNIT. Its attribute names are prefixed with "CEP."

CE.REPAIR

A process simulating the failure and repair of communications equipment. Its attribute names are prefixed with "CER."

CE.TYPE

A permanent entity giving the attributes of the type communications equipment. Its attribute names are prefixed with "CET."

CE.TYPE.POINTER

An attribute of the temporary entity COMMUNICATIONS.EQUIPMENT pointing to its CE.TYPE.

CE.UP.QUANTIY

An attribute of the temporary entity COMMUNICATIONS.EQUIPMENT indicating the quantity of a type of communications equipment in operational condition but not in use.

CEP.ID

An attribute of the temporary entity CE.POINTER pointing to its CE.TYPE.

CEP.LIST

A set of CE.POINTER entities owned by a TYPE.UNIT.

CEP.QUANTITY

An attribute of the temporary entity CE.POINTER giving the quantity of equipment.

CER.EQUIPMENT.TYPE

An attribute of the process CE.REPAIR providing a pointer to the type COMMUNICATIONS.EQUIPMENT under repair.

CER.STATUS

An attribute of the process CE.REPAIR indicating the status of the COMMUNICATIONS.EQUIPMENT in the CE.REPAIR process (awaiting failure, being repaired, destroyed).

CER.UNIT

An attribute of the process CE.REPAIR providing a pointer to the unit owning the equipment being repaired.

CET.CAS.KILLS

An attribute of the permanent entity CE.TYPE indicating the quantity of a type of equipment destroyed by close air support.

CET.CLASS

An attribute of the permanent entity CE.TYPE identifying the general classification for a type of communications equipment.

CET.COLOR

An attribute of the permanent entity CE.TYPE. Its possible values are blue (1) and red (2).

CET.DAMAGE.CLASS

An attribute of the permanent entity CE.TYPE providing a pointer to the damage class relating to a type of equipment.

CET.DF.KILLS

An attribute of the permanent entity CE.TYPE indicating the quantity of a type equipment destroyed by direct fire.

CET.IF.KILLS

An attribute of the permanent entity CE.TYPE indicating the quantity of a type equipment destroyed by indirect fire.

CET.JAMMING.AWARENESS

An attribute of the permanent entity CE.TYPE. Its possible values are YES (1) or NO (2) indicating whether the user of this type equipment can be aware of being jammed.

CET.MTBF

An attribute of the permanent entity CE.TYPE; a value in hours expressing the mean time between failures for this type of equipment.

CET.MTTR

An attribute of the permanent entity CE.TYPE; a value in hours giving the mean time to repair this type of equipment.

CET.NAME

An attribute of the permanent entity CE.TYPE giving the name for a type of communications equipment.

CET.QUANTITY.ASSIGNED

An attribute of the permanent entity CE.TYPE expressing the quantity of a type of communications equipment assigned.

CET.RANGE

An attribute of the permanent entity CE.TYPE expressing the range in meters for a type of communication equipment.

CHAR.PER.WORD

A global variable giving the number of characters which can be stored in one word of the computer system on which the model is to be operated.

CHECK.FEBA.DISTANCE

A routine which determines the distance to the FEBA from a specific unit.

CIRCUIT

A set of NODE entities.

CL.ID

An attribute of the temporary entity COMPOUND.LINK containing the LK.ID of a link that is compound

CL.LIST

A set of COMPOUND.LINK entities owned by a temporary entity *LINK*.

CL.POINTER

An attribute of the temporary entity COMPOUND.LINK containing a pointer to a unit in a COMPOUND.LINK.

CLOSE.AIR.SUPPORT

A process simulating air sorties. Its attribute names are prefixed with "CAS."

CO.ACTION

An attribute of the temporary entity COMM.ORDER specifying the action to be taken as a result of the message (ATTACK, DEFEND, MOVE, WITHDRAW, DELAY, JAM, NONE, or the CO.ID of another message to be transmitted).

CO.DEADLINE.ACTION

An attribute of the temporary entity COMM.ORDER specifying the action to be taken when the deadline time (CO.DEADLINE.TIME) is reached before the message is transmitted (delete or send by messenger).

CO.DEADLINE.TIME

An attribute of the temporary entity COMM.ORDER specifying a period of time in minutes after which the action specified in the attribute CO.DEADLINE.ACTION is taken.

CO.DESTINATION

An attribute of the temporary entity COMM.ORDER specifying the value of the TU.CLASS of the units to which a message is to be sent.

CO.ID

An attribute of the temporary entity COMM.ORDER providing a unique identifer for a communications order.

CO.INTELLIGENCE VALUE

An attribute of the temporary entity COMM.ORDER providing the relative intelligence value (in the range 0 to 100) to the opposing side of the contents of the message (for purposes of interception only).

CO.LENGTH

An attribute of the temporary entity COMM.ORDER reflecting the transmission time (in seconds) of a message.

CO.LIST

A set of COMM.ORDER entities owned by a side.

CO.MEAN.TIME

An attribute of the temporary entity COMM.ORDER representing the frequency of transmission of messages with a time duration stimulus.

CO.MODE

An attribute of the temporary entity COMM.ORDER indicating the method of transmission of a message (VOICE, TT, CW, DATA, MESSAGE).

CO.PRECEDENCE

An attribute of the temporary entity COMM.ORDER indicating the relative order in which a message is to be handled within the system among other messages (DEFERRED, ROUTINE, PRIORITY, IMMEDIATE, FLASH).

CO.PROCESSING.TIME

An attribute of the temporary entity COMM.ORDER representing the interval (in minutes) between the time a decision is made to send a message and when it is transmitted. It is also the interval between receipt of a message and the time it is acted upon.

CO.SECURITY

An attribute of the temporary entity COMM.ORDER indicating the type of security afforded the message (CLEAR; ON.LINE, signifying on-line encryption; or OFF.LINE, signifying off-line encryption).

CO.STIMULUS

An attribute of the temporary entity COMM.ORDER specifying the reason for sending a message (MSG.RECEIPT, INFORMATION, ATTACK.FR, TIME, STRENGTH, FAILURE.FR, CHANGE.MISSION, COORDINATION).

CO.THRESHOLD

An attribute of the temporary entity COMM.ORDER containing a value representing a quantity of information or a strength level, above which a message is transmitted.

CO.USAGE

An attribute of the temporary entity COMM.ORDER identifying the principal usage of a message (COMMAND, INTELLIGENCE, OPERATIONS,

ADMIN.LOGIS, FIRE.DIRECT, SURVEILLANCE, AIR.REQUEST, CAS. COORD, CMMN).

COMBAT.ORGANIZATION.SETUP

A routine which initially processes data input to the model in the major category entitled COMBAT.ORGANIZATION (category V).

COMBAT.POSTURE

A permanent entity for storing data relative to each posture that a unit can assume. Its attribute names are prefixed with "CP."

COMM.ORDER

A temporary entity belonging to a set CO.LIST and containing information pertaining to each communications order. Its attribute names are prefixed with "CO."

COMM.ORGANIZATION.SETUP

A routine which initially processes data input to the model in the major category entitled COMMUNICATIONS ORGANIZATION (category VI).

COMMUNICATIONS.EQUIPMENT

A temporary entity belonging to a set CE.LIST and containing data concerning the communications equipment that a unit possesses. Its attribute names are prefixed with "CE."

COMPOUND.LINK

A temporary entity belonging to a set CL.LIST and used to point to a unit in a compund link. Its attribute names are prefixed with "CL."

CONCATENATE

A routine called by the process TRANSMIT.MESSAGE which concatenates links to form a circuit from the message originator to the destination.

CONTACT.LIST

A set of DIRECT.FIRE.TARGET entities owned by a unit.

CONDITION.V

A global integer subprogram variable; a pointer to the routine which determines whether predefined thresholds have been reached and causes stipulated actions to be taken.

CONTROLS.INPUT

A routine which initially processes data input to the model in the major category entitled CONTROLS (category I).

COORDINATE.INTELLIGENCE

A routine which updates the intelligence log of the receiver.

COUNTER.BATTERY.RADAR

A process which simulates the actions of a counter-battery radar unit. Its attribute names are prefixed with "CBR."

COURIER.POUCH

A set of messages being transported by a specific messenger.

COVER.LIST

A set owned by the permanent compound entity X.GRID, Y.GRID.

COVER.NUMBER.

An attribute of the temporary entity CVR.MEMO.

CP.EFFECTIVENESS

An attribute of the permanent compund entity SIDE., COMBAT. POSTURE. It is a value in the range 0 to 100 representing percentage effectiveness, which is used to modify a unit's strength.

CP.MEAN.TIME.MULTIPLIER

An attribute of the permanent compound entity SIDE., COMBAT. POSTURE. It is a multiplier in the range 0 to 100 used to modify time duration specified in CO.MEAN.TIME.

CRIT.H

An attribut the permanent entity HILL which is a function of input HILL attributes and is used in the STAR Terrain Model.

CS1.LS

A global variable used in the STAR Terrain Model.

CS2.LS

A global variable used in the STAR Terrain Model.

CUT.H.

An attribute of the permanent entity HILL. It is the vertical distance measured down from the peak of the hill, beyond which the hill mass is no longer considered in the computations of the model.

CVR.ELLIPSE

A permanent entity containing descriptive data relating to shape, location, and height of terrain cover.

CVR.MEMO

A temporary entity belonging to the set COVER.LIST identifying each grid square affected by a CVR.ELLIPSE.

D1.REPORT

A routine which generates Input Data Report D1 (CONTROLS), reflecting if the simulation is to be started, reports to be produced, side attributes, and global variables.

D2.REPORT

A routine which generates Input Data Reports D2A (Mobility Index Data), D2B (Obstacles Index Data) and D2C (Base Altitudes) relating to terrain.

D2D.REPORT

A routine which generates Input Data reports D2D (Hill Data) and D2E (Hill Summary Data) relating to terrain.

D2F.REPORT

A routine which generates Input Data Reports D2F (Covers Data) and D2G (Covers Summary Data) relating to terrain.

D3.REPORT

A routine which generates Input Data Reports D3A (Equipment Damage Class Data) and D3B (Communications Equipment Data).

D3C.REPORT

A routine which generates Input Data Report D3C (Electronic Warfare Equipment Data).

D3D.REPORT

A routine which generates Input Data Report D3D (Weapons Data).

D3E.REPORT

A routine which generates Input Data Report D3E (Air Sortie Data).

D4.REPORT

A routine which generates Input Data Report D4A, reflecting type units by side, along with their attributes.

D4B.REPORT

A routine which generates Input Data Report D4B, containing an equipment listing for each type unit.

D4C.REPORT

A routine which generates Input Data Report D4C, reflecting attrition rates for each type of unit.

D4D.REPORT

A routine which generates Input Data Report D4D, reflecting the desirability of firing each type weapon of the opposing side at each type unit class.

D4E.REPORT

A routine which generates Input Data Report D4E. reflecting performance degradation and sector width information.

D5.REPORT

A routine which generates Input Data Report D5 reflecting unit combat organization data.

D6.REPORT

A routine which generates Input Data Reports D6A, reflecting communications nets and links, and D6B, reflecting data for compound links.

D7.REPORT

A routine which generates Input Data Reports D7A, reflecting communications orders for each originating unit, and D7D, listing combat postures.

D7B.REPORT

A routine which generates Input Data Report D7B, listing EW order information.

D7C.REPORT

A routine which generates Input Data Report D7C, listing tactical orders.

DAMAGE.CLASS

A permanent entity containing a value relating to the class to which a piece of equipment belongs.

DATA.PROCESSOR

A routine which controls the various data input and report routines.

DC.VALUE

An attribute of the permanent entity DAMAGE.CLASS; an integer value in the range 0 to 100 inclusive, which is the percent of the AR.COMBAT.ATTRITION to be used for a type of equipment.

DEBUG

A global variable used to specify if model execution is to be in debug mode. If so, attributes of processes and events are written out before their execution.

DEGRADATION.LIST

A set of PERFORMANCE entities owned by the compound entity SIDE., COMBAT.POSTURE, TYPE.UNIT.CLASS.

DELAY.FROM.TRAFFIC

A global variable containing a time period added to reflect delays in message processing.

DFT.FIRE.DISTRIBUTION

An attribute of the temporary entity DIRECT.FIRE.TARGET used to compute DFT.STRENGTH.OPPOSING.

DFT.POINTER

An attribute of the temporary entity DIRECT.FIRE.TARGET which points to the unit on the direct fire CONTACT.LIST.

DFT.STRENGTH.OPPOSING

An attribute of the temporary entity DIRECT.FIRE.TARGET indicating quantity of fire from the owner of the direct fire CONTACT.LIST being received by the unit pointed to by the DFT.POINTER.

DIRECT.FIRE.TARGE

A temporary entity belonging to a CONTACT.LIST and giving information on a unit which is a direct fire target. Its attributes are prefixed with "DFT."

DISTANCE.FROM.FEBA

A function routine which calculates the distance of a unit from the FEBA.

ECC.H

An attribute of the permanent entity HILL, describing the eccentricity of an ellipse representing the hill, defined as the ratio of major axis length to minor axis length.

ELEV

A routine used in the STAR Terrain Model.

ELV1

A routine used in the STAR Terrain Model.

ELIMINATE.UNIT

A routine which eliminates a unit whose strength has fallen below a specified threshold. If it is a command post with an alternate, it activates the alternate.

END.CAS.TRANSMISSION

A routine which releases the link established by CAS.TALK when communication between a ground controller and the air sortie is completed.

END.TRANSMISSION

A routine which releases links used for communications (other than CAS.TALK) when the communication is complete.

END.OF.SIMULATION

An event which causes final status reports to be written and the model to be terminated.

EQUIPMENT.SETUP

A routine which initially processes data input to the model in the major category entitled EQUIPMENT (category III).

ERASE.CIRCUIT

A routine which releases NODE entities for use when the message using the circuit has been transmitted.

ERROR.COUNT

An global variable maintaining a count of errors detected during the execution of the model.

ERROR.MESSAGE

A routine which centralizes error handling for the model. Based on the value of a code, selects and prints the appropriate error message. For fatal errors, calls a routine to write out the current status.

ETU.LOWER.FREQ

An attribute of the temporary entity EW.TARGET.UNIT reflecting the lower limit of the frequency range of an EW.TARGET.UNIT transmitter.

ETU.ORDER

An attribute of the temporary entity EW.TARGET.UNIT identifying the EW.ORDER to be executed.

ETU.POINTER

An attribute of the temporary entity EW.TARGET.UNIT which points to the unit which is the target.

ETU.PRIORITY

An attribute of the temporary entity EW.TARGET.UNIT indicating its relative priority on the EWT.LIST.

ETU.PROCESS.POINTER

An attribute of the temporary entity EW.TARGET.UNIT which points to the process against which EW action is being taken (COUNTER. BATTERY.RADAR, JAMMER, RADAR, TRANSMIT.MESSAGE).

ETU.UPPER.FREQ

An attribute of the temporary entity EW.TARGET.UNIT reflecting the upper limit of the frequency range of an EW.TARGET.UNIT transmitter.

EW.EQUIPMENT

A temporary entity belonging to an EWE.LIST and containing information relating to each piece of EW equipment that a unit possesses. Its attribute names are prefixed with "EWE."

EW.ORDER

A temporary entity belonging to an EWO.LIST and containing data telling a unit when to take an EW action and which action to take.

EW.POINTER

A temporary entity belonging to an EWP.LIST and giving the type and quantity of EW equipment owned by a type unit. Its attribute names are prefixed with "EWP."

EW.TARGET.UNIT

A temporary entity belonging to an EWT.LIST and containing data on an EW target. Its attribute names are prefixed with "ETU." and their values are set by the model.

EW.UNIT.SEARCH

A routine activated by routine NEXT.EW.ORDER to determine if an EW unit exists within range to perform a required EW function.

EWE.ATTRITION

A routine which identifies EW equipment destroyed through routine ATTRITION or processes CLOSE.AIR.SUPPORT or FIRE.MISSION.

EWE.DOWN.QUANTITY

An attribute of the temporary entity EW.EQUIPMENT giving the positive integer quantity of equipment that is currently being repaired.

EWE.FS.QUANTITY

An attribute of the temporary entity EW.EQUIPMENT indicating the quantity of a type of EW equipment originally assigned.

EWE.IN.USE

An attribute of the temporary entity EW.EQUIPMENT indicating the quantity of a type of EW equipment in actual use.

EWE.LIST

A set of EW.EQUIPMENT entities owned by a unit.

EWE.REPAIR

A process simulating the failure and repair of EW equipment. Its attribute names are prefixed with "EWR."

EWE.TYPE

A permanent entity giving the characteristics of a type of EW equipment. Its attribute names are prefixed with "EWE."

EWE.TYPE.POINTER

An attribute of the temporary entity EW.EQUIPMENT indicating the EWE.TYPE.

EWE.UP.QUANTITY

An attribute of the temporary entity EW.EQUIPMENT giving the positive integer quantity of EW equipment that is currently operational.

EWO.DURATION.TIME

An attribute of the temporary entity EW.ORDER indicating a period of time in minutes for which a specified EW action is to be taken.

EWO.FIRST.OPTION

An attribute of the temporary entity EW.ORDER indicating the preferable EW function to be performed, if possible within

available time constraints (INTERCEPT, LOCATE, BARRAGE.JAM, SPOT.JAM).

EWO.LIST

A set of EW.ORDER entities owned by a side.

EWO.MAX.RANGE

An attribute of the temporary entity EW.ORDER indicating the maximum distance in kilometers between the FEBA and the opposing transmitter at which a specified EW order can be carried out.

EWO.MIN.RANGE

An attribute of the temporary entity EW.ORDER identifying the minimum distance in kilometers between the FEBA and the opposing transmitter in order for the specified EW order to be carried out.

EWO.PRIORITY

An attribute of the temporary entity EW.ORDER indicating its relative priority on the EWO.LIST.

EWO.SECOND.OPTION

An attribute of the temporary entity EW.ORDER identifying the EW function to be performed if the first option cannot be carried out (INTERCEPT, LOCATE, BARRAGE.JAM, SPOT.JAM).

EWO.TARGET.NET

An attribute of the temporary entity EW.ORDER identifying the type of opposing net against which specified EW orders are to be carried out (COMMAND, INTELLIGENCE, OPERATIONS, ADMIN.LOGIS, FIRE.DIRECT, SURVEILLANCE, AIR.REQUEST, CAS.COORD, CMMN, UNKNOWN).

EWP.ID

An attribute of the temporary entity EW.POINTER reflecting the name of a type of EW equipment owned by a TYPE.UNIT.

EWP.LIST

A set of EW.POINTER entities owned by a TYPE.UNIT.

EWP.QUANTITY

An attribute of the temporary entity EW.POINTER indicating the quantity of a type of EW equipment (EWP.ID) owned by a TYPE.UNIT.

EWR.EQUIPMENT.TYPE

An attribute of the process EWE.REPAIR identifying the type of equipment undergoing repair.

EWR.STATUS

An attribute of the process EWE.REPAIR indicating the status of the EW.EQUIPMENT In the EWE.REPAIR process (awaiting failure, being repaired, destroyed).

EWR.UNIT

An attribute of the process EWE.REPAIR providing a pointer to the unit owning the equipment being repaired.

EWT.CAS.KILLS

An attribute of the permanent entity EWE.TYPE indicating the quantity of a type of equipment destroyed by close air support.

EWT.CLASS

An attribute of the permanent entity EWE.TYPE, identifying the class of EW equipment being described (LOCATOR, INTECEPTOR, LT. SPOT, NL.SPOT, LT.BARRAGE, CB.RADAR, RADAR, EX.SPOT, EX. BARRAGE).

EWT.COLOR

An attribute of the permanent entity EWE.TYPE, identifying the side to which the EW equipment belong (1 = BLUE; 2 = RED).

EWT.DAMAGE.CLASS

An attribute of the permanent entity EWE.TYPE, identifying the damage class relating to a type of equipment.

EWT.DF.KILLS

An attribute of the permanent entity EWE.TYPE indicating the quantity of a type of equipment destroyed by direct fire.

EWT.DF.TIME

An attribute of the permanent entity EWE.TYPE, identifying the time period (in seconds) required to perform a direction finding function.

EWT.HIGH.FREQ

An attribute of the permanent entity EWE.TYPE indicating the high limit of the frequency range (in megahertz) for which a type of equipment is effective.

EWT.IF.KILLS

An attribute of the permanent entity EWE.TYPE indicating the quantity of a type of equipment destroyed by indirect fire.

EWT.INTELLIGENCE.RATE

An attribute of the permanent entity EWE.TYPE reflecting the rate of gain (per second) of intelligence information by an intercept function.

EWT.LIST

A set of EW.TARGET.UNIT entities owned by a unit.

EWT.LOW.FREQ

An attribute of the permanent entity EWE.TYPE indicting the low limit of the frequency range (in megahertz) for which a type of equipment is effective.

EWT.MTBF

An attribute of the permanent entity EWE.TYPE expressing the mean time between failures (in hours) for a type of equipment.

EWT.MTTR

An attribute of the permanent entity EWE.TYPE expressing mean time (in hours) to repair a type of equipment.

EWT.NAME

An attribute of the permanenet entity EWE.TYPE; the name for a type of equipment being described.

EWT.QUANTITY.ASSIGNED

An attribute of the permanent entity EWE.TYPE expressing the quantity of a type of EW equipment originally assigned.

EWT.RADAR.DURATION

An attribute of the permanent entity EWE.TYPE expressing (for other than counter-battery radar) the time period (in minutes) during which the unit normally transmits pulses and receives the return.

EWT.RADAR.INTERVAL

An attribute of the permanent entity EWE.TYPE expressing (for other than counter-battery radar) the time interval (in minutes) between the intermittent transmission and return periods of pulses.

EWT.RANGE

An attribute of the permanent entity EWE.TYPE reflecting the range (in meters) for a type of equipment.

EXPENDABLE.JAMMER

An external event which initiates a JAMMER process using equipment with EWT.CLASS of EX.SPOT or EX.BARRAGE.

FEBA.POINT

An attribute of the permanent entity Y.GRID indicating the X grid coordinate which is the midpoint between the closest opposing side units for a given Y.GRID.

FIRE.DIRECTION

A routine which tasks artillery units by activating the process FIRE.MISSION.

FIRE.EFFECTIVENESS

A function routine which determines the effectiveness of a unit from the DEGRADATION.LIST based on its accumulated attrition.

FIRE.MISSION

A process which simulates artillery firing. Its attribute names are prefixed with "FM."

FIRST.BLUE

An attribute of the permanent entity Y.GRID indicating the X grid coordinate of the BLUE side unit closest to a RED side unit for a given Y.GRID.

FIRST.PAGE

A routine which generates the cover sheet for DEWCOM reports.

FIRST.RED

An attribute of the permanent entity Y.GRID indicating the X grid coordinate of the RED side unit closest to a BLUE side unit for a given Y.GRID.

FM.ARTY.UNIT

An attribute of the process FIRE.MISSION pointing to the firing unit in the FIRE.MISSION process.

FM.TARGET

An attribute of the process FIRE.MISSION pointing to the target unit in the FIRE.MISSION process.

FM.TERMINATOR

An attribute of the process FIRE.MISSION which indicates whether or not the process was terminated before its successful completion.

GRID.SIZE

A global variable reflecting the distance (expressed in meters) represented by the length of a side of one grid square of the map of the terrain described to the model.

HILL

A permanent entity.

HILL.LIST

A set of HILL entities owned by the compound entity X.GRID, Y.GRID and by temporary entity HILL.MEMO.

HILL.MEMO

A temporary entity belonging to the set HILL.LIST identifying each grid square affected by a HILL.

HILL.NUMBER

An attribute of the temporary entity HILL.MEMO.

HT.E

An attribute of the permanent entity CVR.ELLIPSE representing the height in meters of the trees or other cover above the terrain elevation.

HT.H

An attribute of the permanent entity HILL specifying the maximum height (in meters) of a "normal" curve describing a hill mass.

IE.LOG

A set of INTELLIGENCE.ENTRY entities owned by a UNIT.

IE.OPPOSING.UNIT

An attribute of the temporary entity INTELLIGENCE.ENTRY pointing to an opposing unit about which intelligence information is possessed.

IE.VALUE

An attribute of the temporary entity INTELLIGENCE.ENTRY indicating the quantity of intelligence information possessed concerning an IE.OPPOSING.UNIT.

IEL.LS

A global variable used in the STAR Terrain Model.

IFT.LIST

A set of INDIRECT.FIRE.TARGET entities owned by a UNIT.

IFT.POINTER

An attribute of the temporary entity INDIRECT.FIRE.TARGET pointing to a unit awaiting artillery fire.

IFT.PRIORITY

An attribute of the temporary entity INDIRECT.FIRE.TARGET indicating its relative priority on the IFT.LIST.

IGX.LS

A global variable used in the STAR Terrain Model.

IGY.LS

A global variable used in the STAR Terrain Model.

INDIRECT.FIRE.TARGET

A temporary entity belonging to the set IFT.LIST and pointing to a unit which is an indirect fire target. Its attribute names are prefixed with "IFT."

INITIALIZE

A routine which schedules initial processes and events and initializes subprogram variables CONDITION.V and INTEGRATOR.V.

INT.EQUIPMENT.TYPE

An attribute of the process INTERCEPTOR pointing to EW equipment type performing the interception of opposing side messages.

INT.MESSAGE.POINTER

An attribute of the process INTERCEPTOR which points to the TRANSMIT.MESSAGE process being intercepted.

INT.TARGET

An attribute of the process INTERCEPTOR pointing to the transmitting unit of a TRANSMIT.MESSAGE message being intercepted.

INT.TERMINATOR

An attribute of the process INTERCEPTOR indicating whether or not the process was terminated before its successful completion.

INT.UNIT

An attribute of the process INTERCEPTOR pointing to the unit performing the interception.

INTEGRATOR.V

A subprogram variable which points to the routine determining attrition from direct fire.

INTELLIGENCE.ENTRY

A temporary entity which may belong to the set IE.LOG. Its attribute names are prefixed with "IE."

INTERCEPTOR

A process which simulates the interception of opposing side messages. Its attribute names are prefixed with "INT."

JAMMED.UNIT

A temporary entity belonging to the set JU.LIST; the opposing unit against which the JAMMER process is directed.

JAMMER

A process simulating spot and barrage jamming. It may belong to the set JM.LIST and its attribute names are prefixed with "JM."

JM.DURATION

An attribute of the process JAMMER indicating the period of time in seconds for which a process is carried out.

JM.EQUIPMENT.TYPE

An attribute of the process JAMMER pointing to the equipment type performing the JAMMER process.

JM.LOWER.FREQ

An attribute of the process JAMMER reflecting the lower limit of the frequency range at which the jammer is operating.

JM.PROCESS.POINTER

An attribute of the process JAMMER pointing to the process against which the jamming function is directed (RADAR, COUNTER. BATTERY.RADAR, TRANSMIT.MESSAGE).

JM.TERMINATOR

An attribute of the process JAMMER indicating whether or not the process was terminated before its successful completion.

JM.UNIT

An attribute of the process JAMMER pointing to the unit performing the jamming.

JM.UPPER.FREQ.

An attribute of the process JAMMER reflecting the upper limit of the frequency range at which the jammer is operating.

JU.LIST

A set of JAMMED.UNIT entities.

JU.POINTER

An attribute of the temporary entity JAMMED.UNIT pointing to a unit being jammed.

KCREP

An attribute of the permanenet entity CVR.ELLIPSE determined from input data and used in the STAR Terrain Model.

KHREP

An attribute of the permanent entity HILL determined from input data and used in the STAR Terrain Model.

KOVER

A routine used in the STAR Terrain Model.

KTREP

A global variable used in the STAR Terrain Model.

LAGA.LS

A global variable used in the STAR Terrain Model.

LAGB.LS

A global variable used in the STAR Terrain Model.

LAST.FEBA.UPDATE

A computed global variable reflecting the simulated time at which the FEBA was last updated.

LATOB.LS

A global variable used in the STAR Terrain Model.

LBTOA.LS

A global variable used in the STAR Terrain Model.

LINE.OF.SIGHT

A routine used in the STAR Terrain Model.

LINK

A temporary entity which may belong to a LK.LIST, giving the characteristics of a link. Its attribute names are prefixed with "LK."

LINK.AVAILABILITY

A routine called by TRANSMIT.MESSAGE to determine if a link is available for a specific message and, if so, transmits the message.

LINK.CHECK

A routine called by CONCATENATE to determine if a particular link can be used and, if so, returns the cost of using the link.

LINK.INPUT

A routine which reads in the link input data in the major input data category entitled COMMUNICATIONS ORGANIZATION.

LK.A.END

An attribute of the temporary entity LINK; an integer pointer to the unit at one end of a link. It is input as the UNIT.ID of the unit.

LK.A.EQUIP.POINTER

An attribute of the temporary entity LINK identifying the communications equipment type name used by the LK.A.END of a communications link.

LK.B.END

An attribute of the temporary entity LINK; an integer pointer to the unit at one end of a link. It is input as the UNIT.ID of the unit.

LK.B.EQUIP.POINTER

An attribute of the temporary entity LINK identifying the communications equipment type name used by the LK.B.END of a communications link.

LK.CHANNELS

An attribute of the temporary entity LINK specifying the maximum number of usable channels in a link.

LK.CHANNELS.IN.USE

An attribute of the temporary entity LINK identifying the number of channels actually in use in a link.

LK.CONVERTABILITY

An attribute of the temporary entity LINK indicating whether or not a link converts from radio to wire after the unit has been in one location for a period equivalent to LK.TIME.TO.CONVERT.

LK.DESIRABILITY.OF.USING

An attribute of the temporary entity LINK containing a value in the range 0-100 which reflects the desirability of using a link over an alternate link.

LK.DIRECTION

A attribute of the temporary entity LINK indicating whether a link is a one-way or two-way channel.

LK.ID

An attribute of the temporary entity LINK uniquely identifying a link in a net.

LK.JAMMABILITY.CODE

An attribute of the temporary entity LINK indicating whether a link is affected by jamming.

LK.LIST

A set of LINK entities owned by a NET.

LK.NET.POINTER

An attribute of the temporary entity LINK pointing the the NET to which a LINK belongs.

LK.POINTER

A temporary entity for storing data concerning link membership of a unit.

LK.STATUS

An attribute of the temporary entity LINK indicating its current status (IDLE, BUSY, JAMMED.A.TO.B, JAMMED.B.TO.A, JAMMED.TWO.WAY, DOWN).

LK.SWITCHABILITY.CODE

An attribute of the temporary entity LINK indicating whether a link can be concatenated with another link to transmit a message.

LK.TIME.TO.CONVERT

An attribute of the temporary entity LINK indicating the time (in minutes) required to convert a link from radio to wire.

LOC.ELEMENTS

An attribute of the process LOCATOR indicating the number of DF sites in the LOCATOR process.

LOC.EQUIPMENT.TYPE

An attribute of the process LOCATOR pointing to the type of DF equipment used by the process.

LOC.PROCESS.POINTER

An attribute of the process LOCATOR pointing to the process against which the LOCATOR process is directed (RADAR, TRANSMIT.MESSAGE, COUNTER.BATTERY.RADAR, JAMMER)

LOC.TARGET

An attribute of the process LOCATOR pointing to the opposing unit against which the LOCATOR process is directed.

LOC.UNIT

An attribute of the process LOCATOR pointing to the unit performing the LOCATOR process.

LOCATOR

A process which performs direction finding and identifies the location of an opposing unit. Its attribute names are prefixed with "LOC."

LP.ID

An attribute of the temporary entity LK.POINTER pointing to the link to which a unit belongs.

LP.LIST

A set of LINK.POINTER entities belonging to a UNIT.

M1.REPORT

A routine which generates Model Report M1 (Unit Status).

M2.REPORT

A routine which generates Model Report M2 (Link Status), reflecting the status of all communications links.

M3.REPORT

A routine which generates Model Report M3 (Message Status), reflecting the status of all messages.

M4. REPORT

A routine which generates Model Report M4 (Attrition Summary), reflecting equipment attrition by type.

M5.REPORT

A routine which generates Model Report M5 (EW Status), consisting of two parts, Actions in Progress and Awaiting Actions.

M6.EW.REPORT

A routine which generates the portion of Model Report M6 (Equipment Status) reflecting status of EW Equipment.

M6.REPORT

A routine which generates the portion of Model Report M6 (Equipment Status) reflecting status of Communications Equipment).

M6.WEAPONS.REPORT

A routine which generates the portion of Model Report M6 (Equipment Status) reflecting status of Weapons.

M7.REPORT

A routine which generates Model Report M7 (Intelligence Log), reflecting units which have intelligence information relating to opposing side units.

MAIN

The routine which provides the central control for execution of the DEWCOM model.

MAX.DELAY

A global variable reflecting the maximum time period added to reflect delays in message processing.

MAX.LINKS.IN.CIRCUIT

A global variable reflecting the maximum number of links which may be concatenated to connect two units in a circuit.

MAX.PERMITTED.ERRORS

A global variable reflecting the maximum number of errors detected before the model terminates.

MAX.STEP

A global variable specifying the maximum time interval in minutes between computations of attrition.

MESSAGE.STATUS

A two-dimensional computed global variable which stores alphabetical MESSAGE.STATUS definitions.

MESSENGER

A process which handles sending a messenger if a message does not reach its destination by its deadline time (CO.DEADLINE.TIME) or if NET.TYPE is specified as MESSENGER. Its attribute names are prefixed with "MGR."

MESSENGER.RATE

A global variable reflecting the rate at which a messenger travels, expressed in meters per minute.

MGR.DESTINATION

An attribute of the process MESSENGER identifying the destination unit of a message.

MGR.ORIGIN

An attribute of the process MESSENGER identifying the originating unit of a message.

MGR.TERMINATOR

An attribute of the process MESSENGER indicating whether or not a messenger arrived safely at the destination.

MIN.DELAY

A global variable reflecting the minimum time period added to reflect delays in message processing.

MIN.STEP

A global variable specifying the minimum time interval in minutes between computations of attrition.

MOBILITY.INDEX

An attribute of the compound entity X.GRID, Y.GRID identifying the mobility characteristics of a terrain grid square.

MODE

A two-dimensional computed global variable (alpha array) which stores alphabetical MODE definitions.

MOVE.STEP.SIZE

A global variable reflecting the distance (in meters) that a unit travels before the location coordinates are updated.

MOVE.UNIT

An event which maneuvers units on the battlefield, updating unit position, checking proximity and line of sight to enemy units, and scheduling the next move.

MREPORTS

A global variable (1-dimensional integer array) storing the report numbers of the model reports to be produced by a run of the simulation.

MSG.LIST

A set of TRANSMIT.MESSAGE processes.

MU.UNIT

An attribute of the event MOVE.UNIT pointing to a unit being moved.

NAS.TYPE

An attribute of th event NEW.AIR.SORTIE pointing to the type of sortie being generated.

NAS.UNIT

An attribute of the event NEW.AIR.SORTIE pointing to the unit to which the NEW.AIR.SORTIE belongs.

NET

A temporary entity belonging to a NET.LIST and used to describe a communications net in the model. Its attribute names are prefixed with "NET."

NET.CONTINUOUS.CARRIER

An attribute of the temporary entity NET, indicating whether a net utilizes a continuous (as opposed to intermittent) signal carrier.

NET.FREQ.IN.USE

An attribute of the temporary entity NET identifying the frequency (in megahertz) currently in use by a net.

NET.ID

An attribute of the temporary entity NET uniquely identifying a communications net for a side.

NET.LAST.FREQ.CHANGE

An attribute of the temporary entity NET reflecting the simulated time at which the frequency in use by a NET was last changed.

NET.LIST

A set of NET entities owned by a side.

NET.MODE

An attribute of the temporary entity NET describing the mode or medium for a net (VOICE, TT, CW, DATA, MESSAGE).

NET.PRIMARY.FREQ

An attribute of the temporary entity NET identifying a net's primary frequency (in megahertz).

NET.SECONDARY.FREQ

An attribute of the temporary entity NET identifying a net's secondary frequency (in megahertz).

NET.SECURITY

An attribute of the temporary entity NET indicating the type of security available on a net (CLEAR; ON.LINE, denoting on-line encryption; OFF.LINE, denoting off-line encryption).

NET.TYPE

An attribute of the temporary entity NET indicating the type of communications net being described (RADIO, WIRE, MESSENGER).

NET.USAGE

An attribute of the temporary entity NET indicating the principal usage of a net (COMMAND, SURVEILLANCE, INTELLIGENCE, AIR. REQUEST, OPERATIONS, CAS.COORD, ADMIN.LOGIS, CMMN, FIRE. DIRECT).

NEW.AIR.SORTIE

An event which replaces air sorties that have been expended.

NEWTON

A routine used in the STAR Terrain Model.

NEXT.COMM.ORDER

A routine which finds a net on which a given order can be sent and activates TRANSMIT.MESSAGE.

NEXT.EW.ORDER

A routine which causes units to perform EW orders, activating process JAMMER, LOCATOR, or INTERCEPTOR, as appropriate.

NEXT.INTEGRATE.TIME

A computed global variable specifying the next simulated time at which subprogram variables CONDITION.V and INTEGRATOR.V are to be called.

NEXT.TACTICAL.ORDER

An event which is invoked whenever a unit changes its UN.ACTIVE. TACTICAL.ORDER to update that attribute and to schedule a new NEXT.TACTICAL.ORDER.

NEW.COMBAT.VALUES

A routine which reads in a new WT.COMBAT.VALUE for each WPN. TYPE.

NEW.MOVE.RATES

A routine which reads in new values of TU.MOVE.RATE for all TYPE.UNITS.

NEW.ORDERS

A routine which reads in new orders.

NODE

A temporary entity for storing information concerning a potential link used in computing the next LINK in a circuit.

NODE.COST

An attribute of the temporary entity NODE reflecting the relative cost of using a link (100 minus LK.DESIRABILITY.OF.USING).

NODE.LINK

An attribute of the temporary entity NODE pointing to the identity of a link.

NODE.SENDER

An attribute of the temporary entity NODE pointing to the transmitting unit in a LINK.

NON.COMBAT.ATTRITION

An attribute of the compound entity SIDE., ATTRITION.CLASS, TYPE.UNIT.CLASS reflecting a percentage of attrition other than from combat per combat day.

NTO.CAUSE

An attribute of the event NEXT.TACTICAL.ORDER identifying the stimulus for order change (STRENGTH.THRESHOLD, ATTACK.FORCE.RATIO, FAILURE.FORCE.RATIO, ELAPSED.TIME, MOVED.DISTANCE, DIRECT.ORDER).

NTO.ORDER

An attribute of the event NEXT.TACTICAL.ORDER identifying the action specified by a direct order (ATTACK, DEFEND, MOVE, WITHDRAW, DELAY).

NTO.UNIT

An attribute of the event NEXT.TACTICAL.ORDER pointing to the unit whose order is being changed.

OBSTACLES.INDEX

An attribute of the compound entity X.GRID, Y.GRID describing the obstacle characteristics of a terrain grid square.

ORDERS.SETUP

A routine which initially processes data input to the model in the major category entitled ORDERS (category VII).

PEAK.H

An attribute of the permanent entity HILL, indicating the elevation of the hilltop in meters, measured from zero = sea level.

PERCEIVED.FORCE.RATIO

A function routine which calculates the ratio of opposing forces based on several factors.

PERFORMANCE

A temporary entity belonging to a DEGRADATION.LIST and giving the decreased performance of a unit due to attrition in specified combat postures and for different levels of accumulated attrition. Its attribute names are prefixed with "PF."

PF.DEGRADATION.FACTOR

An attribute of the temporary entity PERFORMANCE giving the percentage effectiveness of a unit for a specified combat posture and level of accumulated attrition.

PF.UPPER.ATTRITION

An attribute of the temporary entity PERFORMANCE giving the upper limit of an attrition range for which a PF.DEGRADATION.FACTOR applies.

POSTURE

A two-dimensional computed global variable (alpha array) used to store alphabetical posture descriptions for output reports.

PXX.E

An attribute of the permanent entity CVR.ELLIPSE determined from input data and used in the STAR Terrain Model.

PXX.H

An attribute of the permanent entity HILL determined from input data and used in the STAR Terrain Model.

PXY.E

An attribute of the permanent entity CVR.ELLIPSE determined from input data and used in the STAR Terrain Model.

PXY.H

An attribute of the permanent entity HILL determined from input data and used in the STAR Terrain Model.

PYY.E

An attribute of the permanent entity CVR.ELLIPSE determined from input data and used in the STAR Terrain Model.

PYY.H

An attribute of the permanent entity HILL determined from input data and used in the STAR Terrain Model.

QQ.OUTPUT

A routine which writes transactions into the QUICK QUERY file.

RADAR

A process simulating the data gathering of radar equipment. Its attribute names are prefixed with "RD."

RADIO.VISIBILITY

A function routine which determines if the ends of a link have radio line of sight.

RANGE

A function routine which computes the range between two units.

RATE.OF.CONTACT

A global variable expressing the rate (in units per minute) at which a unit in contact gathers intelligence about the opposing unit.

RD.EQUIPMENT.TYPE

An attribute of the process RADAR pointing to the equipment type being used.

RD.OWNER

An attribute of the process RADAR identifying the unit owning the RD.EQUIPMENT.TYPE

RD.TERMINATOR

An attribute of the process RADAR indicating whether or not the process was terminated before its successful completion.

READ.THE.NAME

A routine used to read in alphabetical input data.

RECEIPT.OF.MESSAGE

A routine which models the effects of receiving a message.

RELATIVE.DESIRABILITY.OF.FIRING

An attribute of the compound entity TYPE.UNIT.CLASS, WPN.TYPE expressing the relative desirability of firing a weapon of the opposing side at a type unit class.

REMOVE.COMM.LINKAGES

A routine which eliminates communications linkages relating to any unit eliminated by ELIMINATE.UNIT.

REPORT.FREQUENCY

A global variable expressing the frequency in minutes of simulated time at which requested reports are to be produced by the model.

RN.STREAM

A global variable identifying which of 10 available random number streams is to be used by the model.

SD.ARTY.RESET.TIME

An attribute of the permanent entity SIDE expressing the minimum time interval after firing (in minutes) required for an artillery unit to accept a new target.

SD.COLOR

An attribute of the permanent entity SIDE giving the alpha value of BLUE or RED.

SD.COORDINATION.INTERVAL

An attribute of the permanent entity SIDE indicating the minimum time interval (in minutes) separating messages between any two units on a side.

SD.DF.RATE.1.UNIT.OUT

An attribute of the permanent entity SIDE expressing the decreased intelligence gathering capability of a DF unit when one of its sites becomes inoperable, expressed as a percentage of its capability when all sites are operational.

SD.DF.RATE.2.UNITS.OUT

An attribute of the permanent entity SIDE expressing the decreased intelligence gathering capability of a DF unit when two of its sites become inoperable, expressed as a percentage of its capability when all sites are operational.

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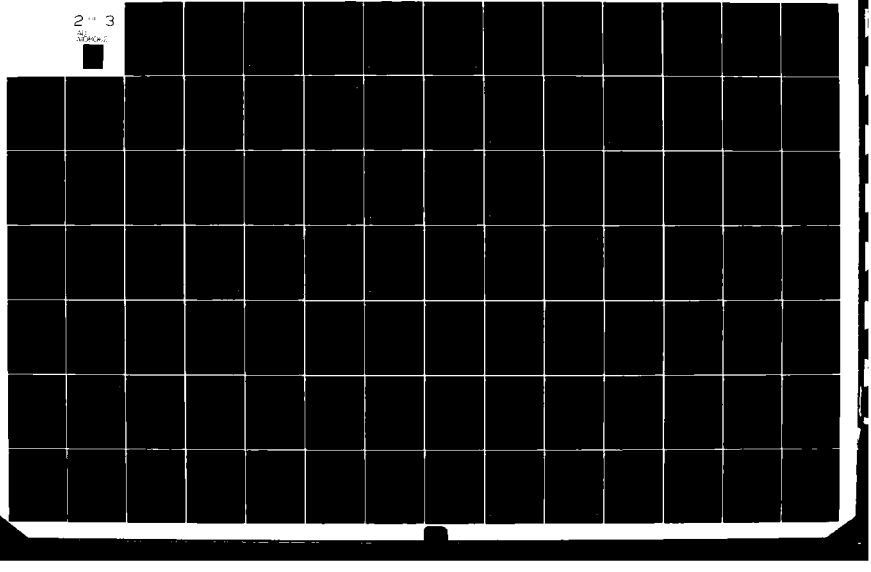

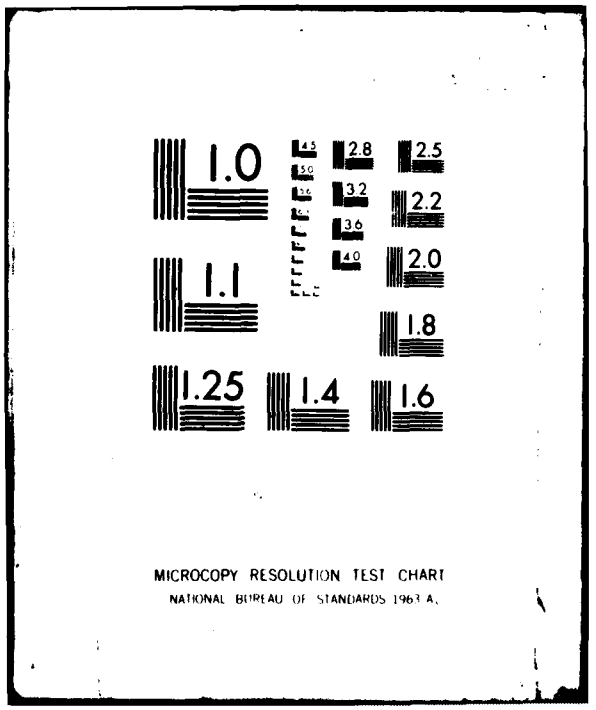
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A.

SD.ENCRYPTION.INTELLIGENCE

An attribute of the permanent entity SIDE denoting a multiplier which modifies the intelligence value of an intercepted encrypted message.

SD.EW.INTEL.THRESHOLD.

An attribute of the permanent entity SIDE identifying a threshold above which the opposing force net type changes from UNKNOWN to a known type.

SD.FIRE.SUPPORT.THRESHOLD

An attribute of the permanent entity SIDE indicating the target strength threshold, above which a unit from which artillery support has been requested, asks for additional artillery support from another fire direction center.

SD.MAX.ARTY.DISTANCE

An attribute of the permanent entity SIDE identifying the threshold distance in meters between an artillery unit and the FEBA, above which the artillery unit moves toward the FEBA.

SD.MAX.EW.DISTANCE

An attribute of the permanent entity SIDE indicating the threshold distance in meters between an EW unit and the FEBA, above which the EW unit moves toward the FEBA.

SD.MIN.ARTY.DISTANCE

An attribute of the permanent entity SIDE indicating the threshold distance in meters between an artillery unit and the FEBA, below which the artillery unit moves away from the FEBA.

SD.MIN.EW.DISTANCE

An attribute of the permanent entity SIDE indicating the threshold distance in meters between an EW unit and the FEBA, below which the EW unit moves away from the FEBA.

SD.MIN.UNIT.STRENGTH

An attribute of the permanent entity SIDE identifying the percentage of its normal unit strength below which a unit ceases to be a factor in the simulation.

SD.PCT.OVER.TRUE.STRENGTH.

An attribute of the permanent entity SIDE; a modifier reflecting the maximum percentage over its normal strength that an opposing unit's strength will be perceived by a unit on this side.

SD.PCT.UNDER.TRUE.STRENGTH

An attribute of the permanent entity SIDE; a modifier reflecting the maximum percentage under its normal strength that an opposing unit's strength will be perceived by a unit on this side.

SD.SUPPORT.THRESHOLD

An attribute of the permanent entity SIDE identifying the target strength threshold above which an artillery unit which cannot provide requested artillery support requests such support from another fire direction center.

SD.WIRE.FAILURE.RATE

An attribute of the permanent entity SIDE indicating the mean time between failure (in hours) of a wire link.

SD.WIRE.MTTR

An attribute of the permanent entity SIDE indicating the mean time to repair a wire link (in hours).

SECTOR.WIDTH

An attribute of the compound entity SIDE., COMBAT.POSTURE, TYPE.UNIT.CLASS giving the sector width (in meters) for a given type unit class for a specified combat posture.

SET

A function routine which is used to verify the validity of alphabetical input terms.

SET.FEBA.POINT

A routine which updates the location of the FEBA for each Y.GRID value.

SIDE

A permanent entity separating data by side (BLUE or RED). Its attribute names are prefixed with "SD."

SIGHT

A function routine; the control program for the STAR Terrain Model to determine whether line of sight exists.

SIGNAL.STRENGTH

A function routine which determines the signal strength in a link.

SIZEA.LS

A global variable used in the STAR Terrain Model.

SIZEB.LS

A global variable used in the STAR Terrain Model.

SNAP.R

A routine called by TIM1.R to write out status information (reports and attributes) at model termination if a SIMSCRIPT execution error occurs.

SNAP.SIDES

A routine called by a SNAP.R to write out attributes of sides and units at model termination if a SIMSCRIPT execution error occurs.

SPRD.H

An attribute of the permanent entity HILL providing a measure of a hill size defined as the distance in meters measured along the major axis from hill center to a contour line which is 50 meters below the peak.

STATUS.REPORTS

An event which causes specified model reports to be generated.

STOP.RESTART

An external event triggered by the user to stop the model, change data, and restart the model.

STOP.THE.MODEL

The routine which is called to stop the model. It prints a message indicating the reason for stopping and writes final reports, if reports have been requested.

TACTICAL.ORDER

A temporary entity belonging to a TO.LIST and giving data on each tactical order. Its attribute names are prefixed with "TO."

TACTICAL.ORDERS.SETUP

A routine which initially processes data input to the model in the subcategory Tactical Orders of the major category entitled ORDERS (category VII).

TAS.CLASS

An attribute of the permanent entity TYPE.AIR.SORTIE identifying the class name (ROTARY or FIXED) for a type air sortie.

TAS.COLOR

An attribute of the permanent entity TYPE.AIR.SORTIE identifying the side to which a sortie belongs (BLUE or RED).

TAS.CURRENT.QUANTITY

An attribute of the permanent entity TYPE.AIR.SORTIE which maintains a count of the number of sorties of a type available at a given time.

TAS.EFFECTIVENESS

An attribute of the permanent entity TYPE.AIR.SORTIE denoting the relative effectiveness of a type air sortie (on a scale of 0 to 100).

TAS.GROUND.COORDINATION

An attribute of the permanent entity TYPE.AIR.SORTIE indicating whether or not contact with a ground controller is required after arrival on target. If "YES" and contact does not occur within the loiter time specified in TAS.LOITER.TIME, the mission is aborted.

TAS.LOITER.ATTRITION

An attribute of the permanent entity TYPE.AIR.SORTIE indicating the probability of a sortie being attritted during loiter time in the vicinity of the target.

TAS.LOITER.TIME

An attribute of the permanent entity TYPE.AIR.SORTIE indicating the time period (in minutes) after arrival in the vicinity of the target, after which the mission is aborted if a message has not been received from a ground controller.

TAS.NAME

An attribute of the permanent entity TYPE.AIR.SORTIE giving the name for a type air sortie being described.

TAS.QUANTITY.ASSIGNED

An attribute of the permanent entity TYPE.AIR.SORTIE indicating the sortie quantity originally assigned.

TAS.RENEWAL.TIME

An attribute of the permanent entity TYPE.AIR.SORTIE indicating the time interval (in minutes) before an expended sortie is again available for use.

TAS.TRANSIT.ATTRITION

An attribute of the permanent entity TYPE.AIR.SORTIE indicating the probability of a sortie being attritted during transit time to the target.

TAS.TRANSIT.TIME

An attribute of the permanent entity TYPE.AIR.SORTIE giving the time period (in minutes) from sortie dispatch until its arrival in the vicinity of the target.

TERRAIN.SETUP

A routine which initially processes data input to the model in the major category entitled TERRAIN (category II).

THRESHOLD.CHECK

A function routine which compares updated strength and intelligence values to determine whether specified thresholds have been achieved and takes appropriate actions.

TIM1.R

The routine which determines the event or process to occur next, allowing the simulation of continuous variables. Its use is fully described in reference 28.

TIME.EOS

A global variable specifying the length of time the simulation is to run, expressed in hours.

TM.CURRENT.SENDER

An attribute of the process TRANSMIT.MESSAGE pointing to the transmitting unit in the current link.

TM.DEADLINE

An attribute of the process TRANSMIT.MESSAGE reflecting the simulated time at which a message being transmitted is to be cancelled or sent by messenger if it has not reached it destination.

TM.DESTINATION

An attribute of the process TRANSMIT.MESSAGE pointing to the ultimate destination unit of the message being transmitted.

TM.LINK

An attribute of the process TRANSMIT.MESSAGE pointing to the current link in the net over which a message is being transmitted.

TM.NET

An attribute of the process TRANSMIT.MESSAGE pointing to the net over which a message is being transmitted.

TM.ORDER

An attribute of the process TRANSMIT.MESSAGE pointing to the COMM.ORDER which was the stimulus for the process.

TM.ORIGINATOR

An attribute of the process TRANSMIT.MESSAGE pointing to the originating unit of a message being transmitted.

TM.PRECEDENCE

An attribute of the process TRANSMIT.MESSAGE reflecting the precedence of a message being transmitted (DEFERRED, ROUTINE, PRIORITY, IMMEDIATE, FLASH)

TM.STATUS

An attribute of the process TRANSMIT.MESSAGE identifying the current status of a message in the process (WAITING.PROCESSING, BEING.PROCESSED, WAITING.LINK, BEING.TRANSMITTED, JAMMED, BY.MESSENGER, WAITING.ENCRYPTION, BEING.ENCRYPTED, A.EQUIPMENT.FAILURE, B.EQUIPMENT.FAILURE, FINAL.PROCESSING).

TM.TARGET

An attribute of the process TRANSMIT.MESSAGE which points to the opposing unit which is the target of a requested CLOSE.AIR.SUPPORT or FIRE.MISSION process.

TM.TERMINATOR

An attribute of the process TRANSMIT.MESSAGE indicating whether or not the process was terminated before its successful completion.

TMACA.LS

A global variable used in the STAR Terrain Model.

TMACB.L

A global variable used in the STAR Terrain Model.

TMICA.LS

A global variable used in the STAR Terrain Model.

TMICB.LS

A global variable used in the STAR Terrain Model.

TO.ATTACK.FORCE.RATIO

An attribute of the temporary entity TACTICAL.ORDER indicating the strength threshold ratio between friendly and opposing forces below which any order being executed is immediately changed to ATTACK.

TO.AZIMUTH

An attribute of the temporary entity TACTICAL.ORDER indicating the direction (in degrees clockwise from grid north) in which the tactical order is to be executed.

TO.FAILURE.FORCE.RATIO

An attribute of the temporary entity TACTICAL.ORDER indicating the strength threshold ratio between friendly and opposing forces above which the FAILURE order specified in TO.FAILURE. NEXT.ORDER is immediately executed.

TO.FAILURE.NEXT.ORDER

An attribute of the temporary entity TACTICAL.ORDER indicating the order (ATTACK, DEFEND, MOVE, WITHDRAW, DELAY) to be executed when the previous order results in failure.

TO.LIST

A set of TACTICAL.ORDER entities owned by a unit.

TO.RANGE

An attribute of the temporary entity TACTICAL.ORDER indicating the distance in meters for which a tactical order is to be carried out by a unit in a moving posture.

TO.STRENGTH.THRESHOLD

An attribute of the temporary entity TACTICAL.ORDER giving the strength threshold percentage below which the FAILURE order specified in TO.FAILURE.NEXT.ORDER is immediately executed.

TO.SUCCESS.NEXT.ORDER

An attribute of the temporary entity TACTICAL.ORDER specifying the order (ATTACK, DEFEND, MOVE, WITHDRAW, DELAY) to be executed when the previous order succeeds.

TO.TIME.DURATION

An attribute of the temporary entity TACTICAL.ORDER specifying a time interval in minutes before a unit selects the next order.

TO.TYPE

An attribute of the temporary entity TACTICAL.ORDER indicating the type of action to be taken (ATTACK, DEFEND, MOVE, WITHDRAW, DELAY, FOLLOW) as a result of the order.

TRACE

A routine, activated if DEBUG has been set to "YES", which writes out the attributes of each process and event before their activation.

TRANSMIT.MESSAGE

A process simulating the sending and receiving of messages. It may belong to a MSG.LIST and its attribute names are prefixed with "TM."

TREE.CHECK

A routine used in the STAR Terrain Model.

TU.ALTERNATE.CP

An attribute of the permanent entity TYPE.UNIT indicating whether an alternate command post exists for this type unit.

TU.ARTY.DURATION

An attribute of the permanent entity TYPE.UNIT giving the duration of fire (in minutes) of an opposing artillery unit against this type unit.

TU.ARTY.INTERVAL

An attribute of the permanent entity TYPE.UNIT giving the interval (in minutes) between periods of fire by an opposing artillery unit against this type unit.

TU.CLASS

An attribute of the permanent entity TYPE.UNIT identifying the class of a unit (HQ, CORPS.HQ, DIV.HQ, BDE.HQ, REGT.HQ, BN.HQ, CO.HQ, ALT.CP, FDC, ARTILLERY, MANEUVER, SUPPORT, EW.UNIT, COMM.UNIT, OTHER)

TU.COLOR

An attribute of the permanent entity TYPE.UNIT identifying the side to which a unit belongs (RED or BLUE).

TU.COMM.SETUP.TIME

An attribute of the permanent entity TYPE.UNIT giving the time period (in minutes) required for a type unit to establish wire communications after change from a moving posture (ATTACK, MOVE, WITHDRAW) to a static posture (DEFEND, DELAY).

TU.COMM.TEARDOWN.TIME

An attribute of the permanent entity TYPE.UNIT indicating the time period (in minutes) required for this type unit to discontinue wire communications before changing from a static posture (DEFEND, DELAY) to moving posture (ATTACK, MOVE. WITHDRAW).

TU.DURATION.OF.SUPPRESSION

An attribute of the permanent entity TYPE.UNIT indicating the time period (in minutes) for which a unit's effectiveness is decreased because of opposing artillery fire.

TU.ENCRYPTION.FACTOR

An attribute of the permanent entity TYPE.UNIT; a multiplier used with message length to determine the time in minutes required to encrypt a message.

TU.EW.PRIORITY

An attribute of the permanent entity TYPE.UNIT giving the relative priority of this type unit for EW actions by an opposing unit.

TU.EW.SETUP.TIME

An attribute of the permanent entity TYPE.UNIT giving the time period (in minutes) before this type unit can initiate EW functions after changing from a moving posture to a static posture.

TU.EW.TEARDOWN.TIME

An attribute of the permanent entity TYPE.UNIT giving the time period (in minutes) required for this type unit to discontinue EW functions in preparation for change from a static posture to a moving posture.

TU.FULL.STRENGTH

An attribute of the permanent entity TYPE.UNIT indicating its strength at the beginning of the simulation.

TU.IF.PRIORITY

An attribute of the permanent entity TYPE.UNIT giving the relative priority of this type unit for indirect fire by an opposing unit.

TU.INTELLIGENCE.FADE.RATE

An attribute of the permanent entity TYPE.UNIT giving the percentage rate per minute at which intelligence information relating to this type unit decreases in value.

TU.MAX.ENCRYPTION.CAPABILITY

An attribute of the permanent entity TYPE.UNIT giving the maximum number of messages which can be encrypted simultaneously by this type unit.

TU.MOVE.RATE

An attribute of the permanent entity TYPE.UNIT giving the rate (in meters per minute) at which this type unit can move.

TU.NAME

An attribute of the permanent entity TYPE.UNIT giving the name of the type unit being described.

TU.RADIUS

An attribute of the permanent entity TYPE.UNIT giving the distance in meters from the location of the center of the unit to its periphery (to determine when opposing units come into contact with each other).

TU.SUPPRESSION.FACTOR

An attribute of the permanent entity TYPE.UNIT indicating the percentage decrease in a unit's effectiveness resulting from it being subjected to opposing artillery fire.

TU.TACTICAL.SETUP.TIME

An attribute of the permanent entity TYPE.UNIT giving the time period (in minutes) required before an artillery unit can be prepared to function after change from a moving to a static posture.

TU.TACTICAL.TEARDOWN.TIME

An attribute of the permanent entity TYPE.UNIT giving the time period (in minutes) required before an artillery unit can change from a static to a moving posture.

TU.CLASS

A computed global variable (two-dimensional alpha array) used to store alphabetical descriptions of TU.CLASS

TYPE.AIR.SORTIE

A permanent entity used to describe air sorties. Its attribute names are prefixed with "TAS."

TYPE.UNIT

A permanent entity used to describe characteristics of units. Its attribute names are prefixed with "TU."

TYPE.UNIT.CLASS

A permanent entity used as an index for compound entities.

TYPE.UNIT.SETUP

A routine which initially processes data input to the model in the major category entitled TYPE UNITS (category IV).

UNIT

A temporary entity describing a collection of personnel and equipment located at a point on a battlefield. It belongs to a UN.LIST and its attribute names are prefixed with "UN."

UN.ACTIVE.TACTICAL.ORDER

An attribute of the temporary entity UNIT pointing to the TACTICAL.ORDER that a unit is executing.

UN.ALTERNATE.CP

An attribute of the temporary entity UNIT indicating whether or not this unit has an alternate command post.

UN.ARTY.STATUS

An attribute of the temporary entity UNIT relating to artillery units only and indicating status of artillery (BUSY, IDLE, or DOWN).

UN.AZIMUTH

An attribute of the temporary entity UNIT indicating the direction in which the unit is moving.

UN.COMM.TIME.TO.RESUME

An attribute of the temporary entity UNIT reflecting the simulated time at which the unit can resume wire communications (stop time + TU.COMM.SETUP.TIME).

UN.ENEMY.INTEL

An attribute of the temporary entity UNIT indicating the quantity of intelligence about a unit possessed by the opposing side.

UN.EW.TIME.TO.RESUME

An attribute of the temporary entity UNIT reflecting the simulated time at which a unit can resume EW functions (stop time + TU.EW.SETUP.TIME).

UN.FORCE.RATIO

An attribute of the temporary entity UNIT reflecting the ratio of the strength of the units with which it is in contact to its strength.

UN.ID

An attribute of the temporary entity UNIT; an identification number which is unique for each unit on a side.

UN.INTEL.LAST.COORDINATION.TIME

An attribute of the temporary entity UNIT reflecting the last simulated time at which the unit received an intelligence update.

UN.LAST.COMBAT.COORDINATION

An attribute of the temporary entity UNIT reflecting the last simulated time at which it received a combat coordination message.

UN.LAST.MOVE.TIME

An attribute of the temporary entity UNIT giving the time that the unit's position was last updated

UN.LIST

A set of UNIT entities owned by a side.

UN.NAME

An attribute of the temporary entity UNIT giving its name.

UN.REMAINING.DISTANCE

An attribute of the temporary entity UNIT reflecting, for a moving unit, the distance it must move to complete its UN. ACTIVE.TACTICAL.ORDER.

UN.STRENGTH

An attribute of the temporary entity UNIT providing the strength of the unit. It is a positive integer value computed by the model.

UN.SUPERIOR.UNIT

An attribute of the temporary entity UNIT containing a pointer of a unit's superior unit in the chain of command.

UN.SUPPRESSION.FACTOR

An attribute of the temporary entity UNIT used in determining its effectiveness after receiving artillery fire.

UN.TACTICAL.TIME.TO.RESUME

An attribute of the temporary entity UNIT relating to an artillery unit and reflecting the simulated time at which it can resume artillery functions (stop time + TU.TACTICAL.SETUP.TIME).

UN.TIME.OF.LAST.ARTY

An attribute of the temporary entity UNIT reflecting the simulated time at which it was last subjected to artillery fire.

UN.TYPE

An attribute of the temporary entity UNIT giving its type.

UN.X.COORDINATE

An attribute of the temporary entity UNIT giving the six digit X UTM grid coordinate of the unit's location.

UN.Y.COORDINATE

An attribute of the temporary entity UNIT giving the six digit Y UTM grid coordinate of the unit's location.

UPDATE.FEBA

A computed global variable reflecting the period of time it would take for the fastest unit to move across one grid square.

UPDATE.INTELLIGENCE

A routine called by ATTRITION to update intelligence values as a result of contact and time decay.

USAGE

A computed global variable (two-dimensional alpha array) used for storing alphabetical descriptions of CO.USAGE, EWO.TARGET.NET, and NET.USAGE values for output reports.

VISFRA.LS

A global variable used in the STAR Terrain Model.

VISFRB.LS

A global variable used in the STAR Terrain Model.

WEAPON

A temporary entity belonging to a WPN.LIST and containing data on the weapons owned by a unit. Its attribute names are prefixed with "WPN." and their values are set by the model.

WEAPONS.ATTRITION

A routine which identifies weapons destroyed as a result of routine ATTRITION.

WP.ID

An attribute of the temporary entity WPN.POINTER reflecting the name of a WPN.TYPE owned by a TYPE.UNIT.

WP.LIST

A set of WPN.POINTER entities owned by a TYPE.UNIT.

WP.QUANTITY

An attribute of the temporary entity WPN.POINTER reflecting the number of a type of weapon (WP.ID) owned by a TYPE.UNIT.

WPN.CURRENT.QUANTITY

An attribute of the temporary entity WEAPON containing a value reflecting its current quantity.

WPN.FS.QUANTITY

An attribute of the temporary entity WEAPON reflecting the originally assigned quantity of the equipment.

WPN.LIST

A set of WEAPON entities owned by a unit.

WPN.POINTER

A temporary entity belonging to a WP.LIST and giving the ID and quantity of a type weapon. Its attribute names are prefixed with "WP."

WPN.TYPE

A permanent entity containing all non-variable data concerning the weapons in the simulation. Its attributes are prefixed with "WT."

WPN.TYPE.POINTER

An attribute of the temporary entity WEAPON pointing to the weapon type.

WT.ATTRITION.CLASS

An attribute of the permanent entity WPN.TYPE reflecting the rate at which attrition of this type weapon is incurred (LIGHT or HEAVY).

WT.CAS.KILLS

An attribute of the permanent entity WPN.TYPE indicating the quantity of a type of weapon destroyed by close air support.

WT.COLOR

An attribute of the permanent entity WPN.TYPE indicating the side to which a weapon belongs (BLUE or RED).

WT.COMBAT.VALUE

An attribute of the permanent entity WPN.TYPE reflecting its combat value (a positive integer in the range 0 to 100).

WT.DAMAGE.CLASS

An attribute of the permanent entity WPN.TYPE indicating the damage class number relating to this type of equipment.

WT.DF.KILLS

An attribute of the permanent entity WPN.TYPE indicating the quantity of a type of weapon destroyed by direct fire.

WT.IF.KILLS

An attribute of the permanent entity WPN.TYPE indicating the quantity of a type of weapon destroyed by indirect fire.

WT.NAME

An attribute of the permanent entity WPN.TYPE reflecting its name.

WT.QUANTITY.ASSIGNED

An attribute of the permanent entity WPN.TYPE expressing the quantity of a type of weapon originally assigned.

WT.RANGE

An attribute of the permanent entity WPN.TYPE indicating the maximum effective range of the weapon (in meters).

WT.TERRAIN.EFFECT

An attribute of the permanent entity WPN.TYPE indicating whether or not terrain is a factor which affects the attrition rate of a type of weapon.

X.GRID

A permanent entity (UTM grid coordinate), which, together with a Y.GRID, identifies the location of a grid square on a map.

X.ORIGIN

A global variable (UTM grid coordinate), identifying the X coordinate of the lower left corner of the map used for the simulation.

XA.LS

A global variable used in the STAR Terrain Model.

XB.LS

A global variable used in the STAR Terrain Model.

XC.E

An attribute of the permanent entity CVR.ELLIPSE; the six-digit X coordinate of the center of an ellipse representing an area of cover.

XC.H

An attribute of the permanent entity HILL; the six-digit X coordinate of the center location of a hill.

Y.GRID

A permanent entity (UTM grid coordinate), which, together with an X.GRID identifies the location of a grid square on a map.

Y.ORIGIN

A global variable (UTM grid coordinate), identifying the Y coordinate of the lower left corner of the map used for the simulation.

YA.LS

A global variable used in the STAR Terrain Model.

YB.LS

A global variable used in the STAR Terrain Model.

YC.E

An attribute of the permanent entity CVR.ELLIPSE; the six-digit Y coordinate of the center of an ellipse representing an area of cover.

YC.H

An attribute of the permanent entity HILL; the six-digit Y coordinate of the center location of a hill.

5.3 Program Descriptions and Listings

This subsection contains a brief statement about the preamble and each routine, event, and process in the DEWCOM Model. Routines are listed after the preamble and main program and are followed by events and processes (alphabetically within each category).

Copies of the DEWCOM Model source code listing are available upon request from:

Commander
US Army Concepts Analysis Agency
8120 Woodmont Avenue
Bethesda, MD 20014
ATTN: CSCA-SM (Director)

5.3.1 The Preamble

The preamble defines all elements in the model including background conditions, permanent and temporary entities and their attributes, processes and their attributes, event notices, external events, computed global variables, input global variables, redefinition of variable names to ensure uniqueness, attribute definitions, set definitions, routine and function declarations, "define to mean" statements, and the possible values for those variables which can assume limited values.

5.3.2 The MAIN Program

The MAIN program is a routine which provides the central control for execution of the DEWCOM Model.

5.3.3 Routines

5.3.3.1 ALPHA.SETUP Routine

This routine establishes the values of the elements in arrays used for alpha output.

5.3.3.2 ATTRITION Routine

This routine updates unit attrition caused by direct contact with opposing units.

5.3.3.3. CALL.SPECIFIC.UNIT Routine

This routine sends a message to one of the units identified as a recipient in the routine which activates the NEXT.COMM.ORDER routine.

5.3.3.4. CAS.TALK. Routine

This routine attempts to find a link between a ground controller and an air sortie if TAS.GROUND.COORDINATION has been set to "YES".

5.3.3.5 CE.ATTRITION Routine

This routine identifies communications equipment destroyed through routine ATTRITION or processes CLOSE.AIR.SUPPORT or FIRE.MISSION.

5.3.3.6 CHECK.FEBA.DISTANCE Routine

This routine determines the distance to the FEBA from a specific unit.

5.3.3.7 COMBAT.ORGANIZATION.SETUP Routine

This routine initially processes data input to the model in the major category entitled COMBAT ORGANIZATION (Catetory V).

5.3.3.8 COMM.ORGANIZATION.SETUP Routine

This routine initially processes data input to the model in in the major category entitled COMMUNICATIONS ORGANIZATION (Category VI).

5.3.3.9 CONCATENATE Routine

This routine is called by the process TRANSMIT.MESSAGE and concatenates links to form a circuit from a message originator to the destination.

5.3.3.10 CONTROLS.INPUT Routine

This routine initially processes data input to the model in the major category entitled CONTROLS (Category I).

5.3.3.11 COORDINATE.INTELLIGENCE Routine

This routine updates the intelligence log of the receiver.

5.3.3.12 D1.REPORT Routine

This routine generates Input Data Report D1 (CONTROLS), reflecting if the simulation is to be started, reports to be produced, side attributes, and global variables.

5.3.3.13 D2.REPORT Routine

This routine generates Input Data Reports D2A (Mobility Index Data), D2B (Obstacles Index Data), and D2C (Base Altitudes), relating to terrain.

5.3.3.14 D2D.REPORT Routine

This routine generates Input Data Reports D2D (Hill Data and D2E (Hill Summary Data) relating to terrain.

5.3.3.15 D2F.REPORT Routine

This routine generates Input Data Reports D2F (Covers Data) and D2G (Covers Summary Data) relating to terrain.

5.3.3.16 D3.REPORT Routine

This routine generates Input Data Reports D3A (Equipment Damage Class Data) and D3B (Communications Equipment Data). A separate portion of Report D3B is produced for each side.

5.3.3.17 D3C.REPORT Routine

This routine generates Input Data Report D3C (Electronic Warfare Equipment Data) with a separate portion produced for each side.

5.3.3.18 D3D.REPORT Routine

This routine generates Input Data Report D3D (Weapons Data) with a separate portion produced for each side.

5.3.3.19 D3E.REPORT Routine

This routine generates Input Data Report D3E (Air Sortie Data) with a separate portion produced for each side.

5.3.3.20 D4.REPORT Routine

This routine generates Input Data Report D4A, which reflects type units separately by side along with their attributes.

5.3.3.21 D4B.REPORT Routine

This routine generates Input Data Report D4B, containing an equipment listing for each type unit with a separate portion produced for each side.

5.3.3.22 D4C.REPORT Routine

This routine generates Input Data Report D4C, which reflects attrition rates for each type of unit separately by side.

5.3.3.23 D4D.REPORT Routine

This routine generates Input Data Report D4D, which reflects the desirability of firing each type weapon of the opposing side at each type unit class. A separate portion is produced for each side.

5.3.3.24 D4E.REPORT Routine

This routine generates Input Data Report D4E, which reflects performance degradation and sector width information separately for each side.

5.3.3.25 D5.REPORT Routine

This routine generates Input Data Report D5, which reflects unit combat organization data for each side.

5.3.3.26 D6.REPORT Routine

This routine generates Input Data Reports D6A, reflecting communications nets and links separately for each side, and D6B, reflecting data for compound links, separately by side.

5.3.3.27 D7.REPORT Routine

This routine generates Input Data Reports D7A, reflecting

communications orders for each originating unit separately by side, and D7D, listing combat postures for both sides.

5.3.3.28 D7B.REPORT Routine

This routine generates Input Data Report D7B, which lists LW order information separately by side.

5.3.3.29 D7C.REPORT Routine

This routine generates Input Data Report D7C, which lists tactical orders separately by side.

5.3.3.30 DATA.PROCESSOR Routine

This routine controls the various data input to the model and the report routines.

5.3.3.31 DISTANCE.FROM.FEBA Routine

This function routine calculates the distance of a unit from the FEBA.

5.3.3.32 ELEV Routine

This routine is used in the STAR Terrain Model.

5.3.3.33 ELIMINATE.UNIT Routine

This routine eliminates a unit whose strength has fallen below a specified threshold. If it is a command post with an alternate, it activates the alternate (which has been assumed to have undergone no attrition).

5.3.3.34 ELV1 Routine

This routine is used in the STAR Terrain Model.

5.3.3.35 END.CAS.TRANSMISSION Routine

This routine releases the link established by CAS.TALK when communication between a ground controller and the air sortie is completed.

5.3.3.36 END.TRANSMISSION Routine

This routine releases links used for communications (other than CAS.TALK) when the communication is completed.

5.3.3.37 EQUIPMENT.SETUP Routine

This routine initially processes data input to the model in the major category entitled EQUIPMENT (Category III).

5.3.3.38 ERASE.CIRCUIT Routine

This routine releases NOTE entities for use when the message using the circuit has been transmitted.

5.3.3.39 ERROR.MESSAGE Routine

This routine centralizes error handling for the model. Based on the value of a code, it selects and prints the appropriate error message. For fatal errors, it calls a routine to write out the current status.

5.3.3.40 EW.UNIT.SEARCH Routine

This routine is activated by routine NEXT.COMM.ORDER to determine if an EW unit exists within range to perform a required EW function.

5.3.3.41 EWE.ATTRITION Routine

This routine identifies EW equipment destroyed through routine ATTRITION or processes CLOSE.AIR.SUPPORT or FIRE.MISSION.

5.3.3.42 FIRE.DIRECTION Routine

This routine tasks artillery units by activating the process FIRE.MISSION.

5.3.3.43 FIRE.EFFECTIVENESS Routine

This function routine determines the effectiveness of a unit from the DEGRADATION.LIST based on its accumulated attrition.

5.3.3.44 FIRST.PAGE Routine

This routine generates the cover sheet for DEWCOM reports.

5.3.3.45 INITIALIZE Routine

This routine schedules initial processes and events, and initializes subprogram variables CONDITION.V and INTEGRATOR.V.

5.3.3.46 INPUT.LOS.TERRAIN Routine

This routine reads in the data for the line-of-sight model (base altitudes, hill data, and cover ellipse data).

5.3.3.47 KOVER Routine

This routine is used in the STAR Terrain Model.

5.3.3.48 LINE.OF.SIGHT Routine

This routine is used in the STAR Terrain Model.

5.3.3.49 LINK.AVAILABILITY Routine

This routine is called by TRANSMIT.MESSAGE to determine if a link is available for a specific message and, if so, transmits the message.

5.3.3.50 LINK.CHECK Routine

This routine is called by CONCATENATE to determine if a particular link can be used and, if so, returns the LK.DESIRABILITY.OF.USING value.

5.3.3.51 LINK.INPUT Routine

This routine reads in the link input data in the major input data category entitled COMMUNICATIONS ORGANIZATION.

5.3.3.52 M1.REPORT Routine

This routine generates Model Report M1 (Unit Status), with a separate part produced for each side.

5.3.3.53 M2.REPORT Routine

This routine generates Model Report M2 (Link Status), reflecting the status of all communications links, with a separate part produced for each side.

5.3.3.54 M3.REPORT Routine

This routine generates Model Report M3 (Message Status), reflecting the status of all messages, with a separate part produced for each side.

5.3.3.55 M4.REPORT Routine

This routine generates Model Report M4 (Attrition Summary), reflecting equipment attrition by type, with a separate part produced for each side.

5.3.3.56 M5.REPORT Routine

This routine generates Model Report M5 (EW Status), which consists of two parts, Actions in Progress and Awaiting Actions. Each part is produced separately for each side.

5.3.3.57 M6.EW.REPORT Routine

This routine generates the portion of Model Report M6 (Equipment Status) reflecting status of EW equipment. It is produced separately for each side. The other two portions are produced by routines M6.REPORT and M6.WEAPONS.REPORT.

5.3.3.58 M6.REPORT Routine

This routine generates the portion of Model Report M6 (Equipment Status) reflecting status of Communications Equipment. It is produced separately for each side. The other two portions are produced by routines M6.EW.REPORT and M6.WEAPONS.REPORT.

5.3.3.59 M6.WEAPONS.REPORT Routine

This routine generates the portion of Model Report M6 (Equipment Status) reflecting status of weapons. It is produced separately for each side. The other two portions are produced by routines M6.REPORT and M6.EW.REPORT.

5.3.3.60 M7.REPORT Routine

This routine generates Model Report M7 (Intelligence Log), which reflects units which have intelligence information relating to opposing side units. It is produced separately for each side.

5.3.3.61 NEWTON Routine

This routine is used in the STAR Terrain Model.

5.3.3.62 NEXT.COMM.ORDER Routine

This routine finds a net on which a given order can be sent and activates TRANSMIT.MESSAGE.

5.3.3.63 NEXT.EW.ORDER Routine

This routine causes units to perform EW orders, activating process JAMMER, LOCATOR, or INTERCEPTOR, as appropriate.

5.3.3.64 NEW.COMBAT.VALUES Routine

This routine reads in a new WT.COMBAT.VALUE for each WPN.TYPE.

5.3.3.65 NEW.MOVE.RATES Routine

This routine reads in new values of TU.MOVE.RATE for all TYPE.UNITS.

5.3.3.66 NEW.ORDERS Routine

This routine reads in new orders.

5.3.3.67 ORDERS.SETUP Routine

This routine initially processes data input to the model in the major category entitled ORDERS (Category VII).

5.3.3.68 PERCEIVED.FORCE.RATIO Routine

This function routine calculates the ratio of opposing forces based on several factors.

5.3.3.69 QQ.OUTPUT Routine

This routine writes transactions into the QWICK QWERY file.

5.3.3.70 RADIO.VISIBILITY Routine

This function routine determines if the ends of a link have radio line-of-sight.

5.3.3.71 RANGE Routine

This function routine computes the range between two units.

5.3.3.72 READ.THE.NAME Routine

This routine reads in alphabetical input data.

5.3.3.73 RECEIPT.OF.MESSAGE Routine

This routine models the effects of receiving a message.

5.3.3.74 REMOVE.COMM.LINKAGES Routine

This routine eliminates communications linkages relating to any unit eliminated by ELIMINATE.UNIT.

5.3.3.75 SET Routine

This function routine is used to verify the validity of alphabetical input terms.

5.3.3.76 SET.FEBA.POINT

This routine updates the location of the FEBA for each Y.GRID value.

5.3.3.77 SIGHT Routine

This function routine is the control program for the STAR Terrain Model to determine whether line-of-sight exists.

5.3.3.78 SIGNAL.STRENGTH Routine

This function routine determines the signal strength in a link.

5.3.3.79 SNAP.R Routine

This routine is called by the TIM1.R routine to write out status information (reports and attributes) at model termination if a SIMSCRIPT execution error occurs.

5.3.3.80 SNAP.SIDES Routine

This routine is called by the TIM1.R routine to write out attributes of sides and units at model termination if a SIMSCRIPT execution error occurs.

5.3.3.81 STOP.THE.MODEL Routine

This routine is called to stop the model. It prints a message indicating the reason for stopping and writes final reports, if reports have been requested.

5.3.3.82 TACTICAL.ORDERS.SETUP Routine

This routine initially processes data input to the model in the subcategory Tactical Orders of the major category entitled ORDERS (Category VII).

5.3.3.83 TERRAIN.SETUP Routine

This routine initially processes data input to the model in the major category entitled TERRAIN (Category II).

5.3.3.84 THRESHOLD.CHECK Routine

This function routine compares updated strength and intelligence values to determine whether specified thresholds have been achieved and takes appropriate actions.

5.3.3.85 TIM1.R Routine

This routine determines the event or process to occur next, allowing the simulation of continuous variables.

5.3.3.86 TRACE Routine

This routine is activated if DEBUG has been set to "YES" and writes out the attributes of each process and event before their activation.

5.3.3.87 TREE.CHECK Routine

This routine is used in the STAR Terrain Model.

5.3.3.88 TYPE.UNIT.SETUP Routine

This routine initially processes data input to the model in the major category entitled TYPE.UNITS (Category IV).

5.3.3.89 UPDATE.INTELLIGENCE Routine

This routine is called by ATTRITION to update intelligence values as a result of attrition and time decay.

5.3.3.90 WEAPONS.ATTRITION Routine

This routine identifies weapons destroyed as a result of routine ATTRITION.

5.3.4 Events

5.3.4.1 BACKGROUND.TRAFFIC Event

This event modifies delay times for messages.

5.3.4.2 END.OF.SIMULATION Event

This event causes final status reports to be written and the model to be terminated.

5.3.4.3 EXPENDABLE.JAMMER Event

This event initiates a JAMMER process using equipment with EWT.CLASS of EX.SPOT or EX.BARRAGE.

5.3.4.4 MOVE.UNIT Event

This event maneuvers units on the battlefield, updating unit position, checking proximity and line-of-sight to enemy units, and scheduling the next move.

5.3.4.5 NEW.AIR.SORTIE Event

This event replaces air sorties that have been expended.

5.3.4.6 NEXT.TACTICAL.ORDER Event

This event is invoked whenever a unit changes its UN.ACTIVE.TACTICAL.ORDER, updating that attribute and scheduling a new NEXT.TACTICAL.ORDER.

5.3.4.7 STATUS.REPORTS Event

This event causes specified model reports to be generated.

5.3.4.8 STOP.RESTART Event

This external event is triggered by the user to stop the model, change data, and restart the model.

5.3.5 Processes

5.3.5.1 CE.REPAIR Process

This process simulates the failure and repair of communications equipment. Its attribute names are prefixed with "CER".

5.3.5.2 CLOSE.AIR.SUPPORT Process

This process simulates air sorties. Its attribute names are prefixed with"CAS".

5.3.5.3 COUNTER.BATTERY.RADAR Process

This process simulates the actions of a counterbattery radar unit. Its attribute names are prefixed with "CBR".

5.3.5.4 EWE.REPAIR Process

This process simulates the failure and repair of EW equipment. Its attribute names are prefixed with"EWR".

5.3.5.5 FIRE.MISSION Process

This process simulates artillery firing. Its attribute names are prefixed with "FM".

5.3.5.6 INTERCEPTOR Process

This process simulates the interception of opposing side messages. Its attribute names are prefixed with "INT".

5.3.5.7 JAMMER Process

This process simulates spot and barrage jamming. It may belong to the set JM.LIST and its attribute names are prefixed with "JM".

5.3.5.8 LOCATOR Process

This process performs direction finding and identifies the location of an opposing unit. Its attribute names are prefixed with "LOC".

5.3.5.9 MESSENGER Process

This process handles sending a messenger if a message does not reach its destination by its deadline time (CO.DEADLINE.TIME) of if NET.TYPE is specified as MESSENGER. Its attribute names are prefixed with "MGR".

5.3.5.10 RADAR Process

This process simulates the data gathering of radar equipment. Its attribute names are prefixed with "RD".

5.3.5.11 TRANSMIT.MESSAGE Process

This process simulates the sending and receiving of messages. It may belong to a MSG.LIST and its attribute names are prefixed with "TM".

5.4 Job Control Language

The following sections give the EXEC 8 control statements required to compile, collect, and run the DEWCOM model. For the purpose of these examples, the file containing the source code, relocatables, and the absolute will be called G3DEWCOM.

5.4.1 Compilation

The following commands will compile the source code. If there is already on up-to-date compilation of the PREAMBLE, run time may be reduced by the statement VERY OLD PREAMBLE. This will suppress the compilation and listing of the PREAMBLE

```
@ASG,A    G3DEWCOM.
@ASG,T    $$$$7,F///800 . OBJECT CODE
@ASG,T    $$$$8,F///800 . STARS
@ASG,T    $$$$11,F///800 . XREF
@ASG,T    $$$$12,F///800 . SCRIPTS
@SIM25,SF ,G3DEWCOM.REL
PREAMBLE
   .
   .
   .
ENDPREAMBLE
   .
   .
   .
   Source code to be compiled
   .
   .
   .
```

5.4.2 Collection

The following commands will collect the relocatables and form the absolute. The overlay structures is required to reduce the amount of core needed for running the model.

```
@PACK G3DEWCOM
@PREP G3DEWCOM
@USE  D,G3DEWCOM
@MAP,L ,D.ABS
     LIB D.
     SEG MAIN
       IN D.MAIN
          SEG IN*,(MAIN)
            IN D.RDATA$PROCES
            IN D.RSTOP$RESTAR
               SEG ALP*, (IN)
                 IN D.RALPHA$SETUP
               SEG INA*, (IN)
                 IN D.RCONTROLS$IN
               SEG OUTA*, (IN)
                 IN D.RD1$REPORT
               SEG INB*, (IN)
                 IN D.RTERRAIN$SET
               SEG OUTB*,(IN)
                 IN D.RD2$REPORT
                    SEG OUTB1*, (OUTB)
                      IN D.RD2D$REPORT
                    SEG OUTB2*, (OUTB)
                      IN D.RD2F$REPORT
               SEG INC*, (IN)
                 IN D.REQUIPMENT$S
               SEG OUTC*, (IN)
                 IN D. RD3$REPORT
                    SEG OUTC1*, (OUTC)
                      IN D.RD3C$REPORT
                    SEG OUTC2*, (OUTC)
                      IN D.RD3D$REPORT
                    SEG OUTC3*, (OUTC)
                      IN D.RD3E$REPORT
               SEG IND*, (IN)
                 IN D.RTYPES$UNIT$S
```

```
                    SEG OUTD*, (IN)
                      IN D.RD4$REPORT
                          SEG OUTD1*, (OUTD)
                            IN D.RD4B$REPORT
                          SEG OUTD2*, (OUTD)
                            IN D.RD4C$REPORT
                    SEG OUTD3*, (OUTD)
                            IN D.RD4D$REPORT
                         SEG OUTD4*,, (OUTD)
                    SEG OUTD4*, (OUTD)
                            IN D.RD4E$REPORT
                    SEG INE*, (IN)
                      IN DE.RCOMBAT$ORGA
                    SEG OUTE*, (IN)
                      IN D.RD5$REPORT
                    SEG INF*, (IN)
                      IN D.RCOMM$ORGANI
                    SEG OUTF*, (IN)
                      IN D.RD6$REPORT
                    SEG ING*, (IN)
                      IN. D.RORDERS$SETUP
                    SEG OUTG*, (IN)
                      IN D.RD7$REPORT
                              SEG OUTG1*, (OUTG)
                                IN D.RD7B$REPORT
                              SEG OUTG2*, (OUTG)
                                IN D.RD7C$REPORT
SEG A*, (MAIN)
  IN D.RCE$REPAIR
SEG B*, (MAIN)
  IN D.RCLOSE$AIR$S
SEG C*, (MAIN)
  IN D.RCOUNTER$BAT
SEG D*, (MAIN)
```

```
    IN D.REWE$REPAIR
SEG E*, (MAIN)
    IN D.RFIRE$MISSIO
SEG F*, (MAIN)
    IN D.RINTERCEPTOR
SEG G*, (MAIN)
    IN D.RJAMMER
SEG H*, (MAIN)
    IN D.RLOCATOR
SEG I*, (MAIN)
    IN D.RMESSENGER
SEG J*, (MAIN)
    IN D.RRADAR
SEG K*, (MAIN)
    IN D. RTRANSMIT$ME
SEG L*, (MAIN)
    IN D.RBACKGROUND$
SEG M*, (MAIN)
    IN D.REND$OF$SIMU
SEG N*, (MAIN)
    IN D.RSTATUS$REPO
SEG O*, (MAIN)
    IN D.RMOVE$UNIT
SEG P*, (MAIN)
    IN D.RNEW$AIR$SOR
SEG Q*, (MAIN)
    IN D.RNEXT$TACTIC
SEG R*, (MAIN)
    IN D.REXPENDABLE$
END
```

5.4.3 Running

Running the model requires three input files and three output files, in addition to the file containing the absolute. They must be assigned to the SIMSCRIPT units as shown below:

- G3DEWCOM contains the data inputs described in section 3.

- G3EXJ contains the external event cards used to schedule the event EXPENDABLE.JAMMER.

- G3SRS contains the external event cards used to schedule the event STOP.RESTART.

- G3PRINT will receive the data and model reports and all data written on unit 6.

- G3OUT will recieve the error message and any other data written on Unit 8.

- G3QQOUT will recieve the QWICK QWERY transactions and will alter be used by the QWICK QWERY Post-processor to construct reports.

```
@ASG,A    G3DEWCOM.
@ASG,A    G3DEWCOMDATA.
@ASG,A    G3OUT.
@ASG,A    G3QQOUT.
@ASG,A    G3PRINT.
@ASG,A    G3EXJ.
@ASG,A    G3SRS.
@ERS      G3OUT.
@USE      SIMU8.,G3OUT.
@USE      SIMU9., G3EXJ.
@USE      SIMU10., G3SRS.
@USE      SIMU12., G3QQOUT.
@XQT      G3DEWCOM.ABS
```

APPENDIX A

APPENDIX A

GLOSSARY OF TERMS

ACKNOWLEDGEMENT	A message from the addressee informing the originator that his communication has been received and understood. (FM 24-1)
ADDRESSEE	The activity or individual to whom a message is directed by the originator. Addressees are indicated as either "ACTION " or "INFORMATION". (FM 24-1)
ADDRESS INDICATING GROUP	An address group which represent a specific set of action or information addressess. (FM 24-1)
AREA SIGNAL CENTER	This signal center provides communications to units within its assigned geographical area of responsibility. This ties the units into the area communications system and supplements their organic means for communications with higher, subordinate, or adjacent headquarters. (FM 24-1)
ATTENUATION	Decrease in strength of a signal, beam, or wave as a result of absorption of energy and of scattering out of the path of a receiver. (FM 24-1).
AUTOMATIC CENTRAL OFFICE	A switch at which communications between subscribers is effected without the intervention of an operator. The electronic switches are controlled by the operation of a keysender on the instrument of the originating subscriber. (FM 24-1)

AUTOMATIC DATA PROCESSING SYSTEM	Automatic Data Processing Equipment linked together by communication and data transmission equipment to form an integrated system for the processing and conveyance of data. (FM 24-1)
BARRAGE JAMMING	The jamming of several channels or frequencies simultaneously. (FM 24-1)
CHAFF	Radar confusion reflectors, which consist of thin, narrow metallic strips of various lengths and frequency responses, used to reflect echoes for confusion purposes. (FM 24-1)
CHANNEL	A facility for telecommunications on a system or circuit. The number of independent channels on a system or circuit is measured by the number of separate communications facilities that can be provided by it. (FM 24-1)
CIPHER, OFF-LINE	A method of encryption which is not associated with a particular transmission system and in which the resulting cryptogram can be transmitted by any means. (FM 24-1)
CIPHER, ON-LINE	An automatic method of encryption associated with a particular transmission system, whereby signals are encrypted and passed directly through the line to operate the reciprocal equipment at the distant station. (FM 24-1)
CIRCUIT	An electronic path between two or more points capable of providing a number of channels. (FM 24-1)

COMMAND POST	A headquarters for a unit from which command and control is centrally exercised. (FM 24-1)
COMMAND SIGNAL CENTER	This signal center provides communications for command and control at division and corps headquarters and to units located in the immediate area as facilities permit. (FM 24-1)
COMMAND SYSTEM	A communications network which connects an echelon of command with some or all of its subordinate echelons for the purpose of command and control. (FM 24-1)
COMMON-USER CIRCUIT	A circuit allocated to furnish communications paths between switching centers to provide communications service on a common basis to all connected stations or subscribers. (FM 24-1)
COMMUNICATIONS-ELECTRONICS OPERATION INSTRUCTIONS	A series of orders issued for the technical control and coordination of the signal communications activities of a command. (FM 24-1)
COMMUNICATIONS NODAL CONTROL ELEMENT	A dual function facility that incorporates both facilities control and technical control requirements. The technical control element contains patching, testing, conditioning, and monitoring equipment and provides technical control or circuits in and through the facility. The management element provides management and control of C-E functions within the node. (FM 24-1)
COMMUNICATIONS SYSTEM	Provides actual focal point for dynamic control, acts as operations center for command

	system, and directs organic and subordinate C-E systems. Maintains the data base. Replaces the term SYSCON. (FM 24-1)
CONTINUOUS WAVE	Morse Code transmissions achieved by on and off keying of an unmodulated carrier wave, or by the keying of a modulating subcarrier wave with the carrier suppressed. (FM 24-1)
DATA LINK	A communication link suitable for transmission of data. (FM 24-1)
DIAL CENTRAL OFFICE	A switch at which communications between subscribers is effected without the intervention of an operator, by means of relays set in motion by the operation of a dial on the instrument of the originating subscriber. (FM 24-1)
DIVERSITY SYSTEM	A system of communications in which a single received signal is derived from a combination of, or selections from, a plurality of transmission channels or paths. (FM 24-1)
DUPLEX OPERATION	Duplex (or "Full Duplex") operation refers to communications between two points in both directions simultaneously. (FM 24-1)
ELECTROMAGNETIC COMPATIBILITY	The ability of C-E equipments, subsystems, and systems to operate in their intended operational environments without suffering or causing unacceptable degradation because of unintentional electromagnetic radiation or response. (FM 24-1)

ELECTRONIC COUNTER-COUNTERMEASURES	That division of electronic warfare involving actions taken to insure friendly effective use of the electromagnetic spectrum. (FM 24-1)
ELECTRONIC COUNTERMEASURES	That major subdivision of electronic warfare involving actions taken to prevent or reduce the effectiveness of enemy equipment and tactics employing or affected by electromagnetic radiations, and to exploit the use by the enemy of such radiations. (FM 24-1)
ELECTRONIC DECEPTION	The deliberate radiation, re-radiation, alteration, absorption or reflection of electromagnetic energy in a manner intended to mislead in enemy in the interpretation or use of information received by his electronic systems. There are two categories of deception: MANIPULATIVE and IMITATIVE. (FM 24-1)
ELECTRONIC INTELLIGENCE	The intelligence information product of activities engaged in the collection and processing, for subsequent intelligence purposes, of foreign, noncommunications, electromagnetic raditions emanating from other than nuclear detonations and radioactive sources. (FM 24-1)
ELECTRONIC JAMMING	The deliberate radiation, re-radiation, or reflection of electromagnetic energy with the object of impairing the use of electronic devices, equipment or systems being used by an enemy. (FM 24-1)
ELECTRONIC WARFARE	That division of military use of electronics involving actions taken to prevent or reduce an effective use by an enemy of radiated elec-

	tromagnetic energy, and actions taken to insure our own effective use of radiated electromagnetic energy. Electronic warfare consists of Electronic Countermeasures (ECM), Electronic Counter-countermeasures (ECCM), and Electronic Warfare Support Measures (ESM). (FM 24-1)
ELECTRONIC WARFARE SUPPORT MEASURES	That division of EW involving actions taken to search for, intercept, locate, record, and analyze radiated electromagnetic energy, for the purpose of exploiting such radiations in support of military operations. Thus, ESM provides a source of EW information required to conduct ECM, ECCM, Threat Detection, Warning, Advoidance, Target Acquisition and Homing. (FM 24-1)
FACSIMILE	A system of telecommunications for the transmission of fixed images with a view to their reception in a permanent form. (FM 24-1)
FREQUENCY ASSIGNMENT	The process of designating a radio frequency for use at a specific station or by a specific military unit under specified conditions of operation. (FM 24-1)
GROUND WAVE	In propagation, that portion of the transmitted radio wave that travels near the surface of the earth. (FM 24-1)
HALF-DUPLEX	The capability of operating in either direction, but not in both directions simultaneously. It is also called "SIMPLEX". (FM 24-1)

IMITATIVE ELECTRONIC DECEPTION	The intrusion on the channels of the enemy and the introduction of matter in imitation of his own for the purpose of deceiving or confusing him. (FM 24-1)
INTERCEPTION	The act of searching for and listening to and/or recording commmunications and electronic transmissions for the purpose of obtaining intelligence. (FM 24-1)
INTERFACE	A point common to two or more systems or other entities across which useful information flow takes place. (FM 24-1)
INTERFERENCE	Any electrical disturbance which causes undesirable responses in electronic equipment (FM 24-1)
LASER	A device that utilizes the natural oscillations of atoms for amplifying or generating electromagnetic waves in the region of the spectrum from the ultraviolet to the far-infrared, including the visible region. (FM 24-1)
LIGHT ANTIARMOR WEAPON	The M72A2 is a close-in, lightweight, smoothbore, percussion-fired antiarmor weapon which is designed to give the individual infantryman the capability of defeating armored vehicles. (FM 24-1)
LINK	The basic component of an circuit which assures a direct connection between two units. (See ROUTE)

LOCAL LOOP	A circuit connecting an end instrument to a switching facility or distribution point. (FM 24-1)
MANIPULATIVE ELECTRONIC DECEPTION	The use of friendly electromagnetic radiations so as to falsify the information which a foreign nation can obtain from their analysis. (FM 24-1)
MANUAL CENTRAL OFFICE	A switch in which the lines are connected to a switchboard and interconnections are controlled by an operator. (FM 24-1)
MESSAGE	A demand placed on the communications system which contains some information to be transmitted along a route from one unit to another.
MIJI REPORT	A report to a higher headquarters of an incident of interference in the reception of radio signals. (FM 24-1)
MINIMIZE	A condition wherein normal messages and telephone traffic are drastically reduced, in order that messages connected with an actual or simulated emergency will not be delayed. (FM 24-1)
MULTI-AXIS	More than one line along which communications takes place. (FM 24-1)
MULTI-MEANS	More than one method or system over which a message can be transmitted. (FM 24-1)
MULTIPLEX	The simultaneous use of a number of channels on a single circuit. (FM 24-1)

NET	An entire communications network consisting of one or more circuits.
NET CONTROL STATION	A station designated to control traffic and enforce circuit discipline within a given net. (FM 24-1)
NETWORK	An organization of stations capable of intercommunication but not necessarily on the same channel. (FM 24-1)
NODE	An end point of a link. It may also be a switching point for messages and is co-located with a unit.
OPERATION ORDER	A directive, usually formal, issued by the commander to subordinate commanders for the purpose of effecting the coordinated execution of an operation. (FM 24-1)
PRECEDENCE	A designation, assigned to a message by the originator, to indicate to communications personnel the relative order of handling and to the addressee the order in which the message is to be noted. (FM 24-1)
RADIO DIRECTION FINDING	Radio locations in which only the direction of a station is determined by means of its emission. Since this technique can be used against all electronic emitters, it is sometimes simply referred to as direction finding. (FM 24-1)
RADIO LISTENING SILENCE	Designated radio stations are instructed to monitor their receivers for incoming traffic but not to transmit for a specified period or until further ordered. (FM 24-1)

RADIO RELAY SYSTEM	A radio transmission system in which the signals are received and transmitted from point to point by intermediate radio stations. This system, normally used in conjunction with carrier equipment, provides channels for both voice and teletypewriter operations. (FM 24-1)
RADIO SILENCE	A period during which all or certain radio equipment capable of radiation is kept inoperative. (FM 24-1)
RADIO TELETYPEWRITER	The system of communication by teletypewriter over radio circuits. (FM 24-1)
RADIO WIRE INTEGRATION	The interconnection of wire circuits with radio facilities. (FM 24-1)
READABILITY	The abiltity to be understood, i.e., the readability of signals sent by any means of telecommunications. (FM 24-1)
RETRANSMISSION	Employment of a radio communication set for the purpose of rebroadcasting a message on a different frequency simultaneously with the original broadcast by means of an electrically operated linkage device between the receiver and transmitter of the set. (FM 24-1)
ROUTE	A sequence of links over which messages can be transmitted. It is dynamically selected as a function of the type of message to be transmitted and as a function of the characteristics of the links. (See LINK)

ROUTING	The process of determining and prescribing the path or method to be used in forwarding messages. (FM 24-1)
SIGNAL INTELLIGENCE	The final produce resulting from collection, evaluation, analysis, integration, and interpretation of information gathered from hostile electronic emitters. It includes Communications Intelligence and Electronic Intelligency and is used in determining enemy Order of Battle and planning of future operations.
SOLE-USER CIRCUIT	A circuit from one subscriber to another subscriber on a fixed path. (FM 24-1)
SPOT JAMMING	The jamming of a specific channel or frequency. (FM 24-1)
SWITCHBOARD	An apparatus on which the various circuits from subscribers and other switchboards are terminated to enable communications either between two subscribers on the same switchboard or between subscribers on different switchboards. (FM 24-1)
TACTICAL COMMUNICATIONS	Communications provided by, or under the operational control of, commanders of combat forces, combat troops, combat support troops, or forces assigned a combat service support mission. (FM 24-1)
TACTICAL OPERATIONS CENTER	A facility from which selected special or general staff members assist in the direction, coordination, and control of current combat operations. (FM 24-1)

TANDEM SWITCH	A switch used primarily as a switching point for traffic between other switches. (FM 24-1)
TAPE RELAY	A method of receiving and retransmitting messages in tape form. (FM 24-1)
TELECOMMUNICATIONS CENTER	An agency charged with the responsibility for acceptance, preparation for transmission, receipt, duplication and delivery of messages. (FM 24-1)
TEXT	That part of a message which contains the thought or idea which the originator desires to be communicated. (FM 24-1)
TRUNK CIRCUIT	A circuit directly connecting two distant central offices. (FM 24-1)
UNIT	A concentration of equipment and personnel on the battlefield. Units move on the battlefield, engage in combat, communicate with each other and apply Electronic Warfare Support Measures (ESM), Electronic Countermeasures (ECM), and Electronic Counter-countermeasures (ECCM) to enemy communications.
VOICE FREQUENCY	Any frequency within the part of the audio frequency range essential for the transmission of speech of commercial quality, i.e., 300-3000 Hz. (FM 24-1)

APPENDIX B

APPENDIX B

GLOSSARY OF ABBREVIATIONS

ADPS	Automatic Data Processing System
AIG	Address Indicating Group
AM	Amplitude Modulation
ARDF	Airborne Radio Direction Finding
ASA	Army Security Agency
ATSE	Army Security Agency Tactical Support Element
CAS	Close Air Support
C-E	Communications-Electronics
CEOI	Communications Electronics Operating Instructions
CFA	Covering Force Area
CNCE	Communications Nodal Control Element
COMINT	Communication Intelligence
CP	Command Post
CSCE	Communications System Control Element
CW	Continuous Wave
C2	Command and Control
C3	Command, Control, and Communications
DEWCOM	Divisional Electronic Warfare Combat
DF	Direction Findings
EAC	Echelons Above Corps
ECCM	Electronic Counter-Countermeasures
ECM	Electronics Countermeasures
EIM	Extended Interface Meeting
ELINT	Electronic Intelligence
EMC	Electomagnetic Compatibility
EMCON	Emission Control
ESM	Electronic Warfare Support Measures
EW	Electronic Warfare
EWCO	Electronic Warfare Cryptologic Officer
FAX	Facsimile
FEBA	Forward Edge of the Battle Area
FM	Frequency Modulation

HF	High Frequency
HQ	Headquarters
IAW	In Accordance With
ICD	Imitative Communication Deception
JTF	Joint Task Force
LAW	Light Antiarmor Weapon
LOS	Line of Sight
MED	Manipulative Electronic Deception
MIJI	Meaconing, Intrusion, Jamming, Interference
MRD	Motorized Rifle Division
MRR	Motorized Rifle Regiment
MTBF	Mean Time Between Failures
MTTR	Mean Time to Repair
NBC	Nuclear, Biological and Chemical
NCS	Net Control Station
OPSEC	Operations Security
RATT	Radio Teletypewriter
RDF	Radio Direction Finding
RWI	Radio Wire Integration
SAG	Study Advisory Group
SDD	Software Design Document
SDDL	Software Design and Documentation Language
SEAD	Suppression of Enemy Air Defense
SIGINT	Signal Intelligence
TOC	Tactical Operations Center
UHF	Ultra High Frequency
VHF	Very High Frequency
VT	Variable Time

APPENDIX C

APPENDIX C

REFERENCES

1. Source listing of COMMEL II.5 simulator with a variable name dictionary and subroutine cross-reference list.

2. Source listing of Tactical Preprocessor for COMMEL II.5 with a variable name dictionary.

3. Source listing of Communications Preprocessor for COMMEL II.5 with a variable name dictionary.

4. Source listing of Subtactical Message Preprocessor for COMMEL II.5 with a variable name dictionary.

5. Input and output for benchmark run of COMMEL II.5 - Alpha Offense with force ratio = 1.6 (tactical only; perfect communications; no EW).

6. COMMEL II.5 Users Manual
   - Volume I - Model Overview
   - Volume II - Input Data Preparation
   - Volume III - Appendices
   - Volume IV - Blank Data Forms
   - Volume V - Electronic Warfare Addendum (COMMEL II.5)

7. Conceptual logic of the functional processes for additions to the model.

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11. A General Automated Terrain Simulation, M. R. Weldon, Army Missile Command Report No. TR-WS-74-1, March 1974.

12. Terrain Mapping and Line of Sight Programs, D. K. Jefferson, NSWC/DL TR-3339, July 1975.

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14. The COMMEL Model
Final Report
Annex A - Description of the COMMEL Model
Annex B - COMMEL Model Program Documentation (6 volumes)
Annex C - COMMEL Model Users Guide
Annex D - Sensitivity Analysis
Annex E - Use of the COMMEL Model for Parametric Evaluation of Communications Problems
Supplement to Annex C, Appendix 2 - Facsimilies of Tactical Data Input Forms.

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Final Report
Annex I: The Signal Corps Ground Combat Simulator
Volume I - Theory, Organizatization, and Structure of the Model (2 parts)
Volume II - Flowcharts and the Data Set (3 parts)
Volume III - Exercise Goldleaf
Appendix A to Volume III, Section 1 - Maps
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26. FM 24-1, Combat Communications, 1976.

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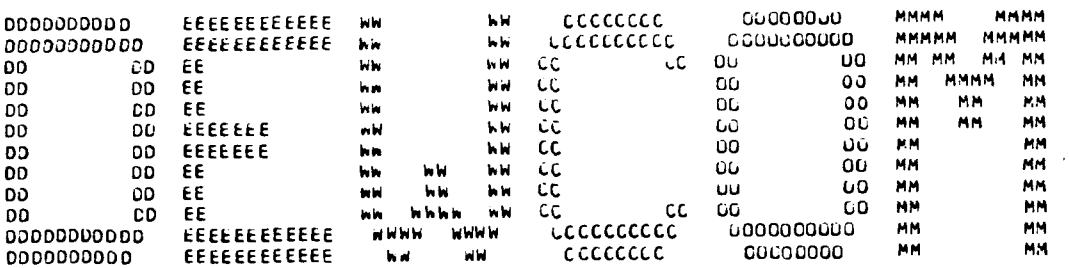
29. Parametric Terrain and Line of Sight Modelling in the STAR Combat Model, James K. Hartman, NPS 55-79-018, August 1979.

APPENDIX D



DIVISIONAL ELECTRONIC WARFARE COMBAT MODEL

CONCEPTS ANALYSIS AGENCY

US ARMY

INPUT DATA REPORTS

DEVELOPED BY

CACI, INC. - FEDERAL
1815 NORTH FORT MYER DRIVE
ARLINGTON, VIRGINIA 22209

BEGIN SIMULATION = NC

GLOBAL VARIABLES

CHARACTERS PER WORD	4		BACKGROUND TRAFFIC UPDATE TIME	15.0	MIN
MAX PERMITTED ERRORS	5		DT.V	5.0	
MAX LINKS IN CIRCUIT	5		MAX STEP	500.0	
MOVE STEP SIZE	200	METERS	MIN STEP	100.0	
RATE OF CONTACT	30		MIN DELAY	20.0	MIN
RANDOM NUMBER STREAM	2		MAX DELAY	60.0	MIN
STOP TIME	6.0	HOURS	REPORT FREQUENCY	30.0	MIN
TIME EOS	1.0	HOURS	MESSENGER RATE	1500	METERS/MIN
DEBUG	1.0	HOURS			

REPORTS TO BE PRINTED

DATA PROCESSOR : 1 2 3 4 5 6 7
MODEL : NONE

SIDE ATTRIBUTES

NAME	BLUE	RED	
ENCRYPTION INTELLIGENCE	5	5	
EW INTEL THRESHOLD	40	40	
SUPPORT THRESHOLD	30	30	
FIRE SUPPORT THRESHOLD	30	30	
COORDINATION INTERVAL	45	45	MINUTES
MIN UNIT STRENGTH	20	20	
ARTY RESET TIME	55	55	MINUTES
ARTY CONTACT RANGE	20000	20000	METERS
MIN ARTY DISTANCE	1000	1000	METERS
MAX ARTY DISTANCE	2000	2000	METERS
MIN EW DISTANCE	10000	10000	METERS
MAX EW DISTANCE	15000	15000	METERS
WIRE FAILURE RATE	4	4	
WIRE MTTR	3	3	HOURS
DF RATE - 1 UNIT OUT	50	50	
DF RATE - 2 UNITS OUT	70	70	
PCT OVER TRUE STRENGTH	15	15	
PCT UNDER TRUE STRENGTH	10	10	

TERRAIN
MOBILITY INDEX

REPORT D2-A
PAGE 1

ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

Y OFFSET	X OFFSET 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
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37	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
38	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
39	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

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ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 60 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

X OFFSET

Y OFFSET	39					44					49					54					59					64					69
0	2	3	2	3	2	2	2	2	2	4	3	2	2	2	3	2	2	2	2	2	2	2	2	2	2	3	3	2	2	2	2	2	3	3	4
1	2	2	2	3	4	2	2	2	2	4	3	2	2	2	2	2	3	2	2	2	2	2	2	3	3	3	3	2	3	2	2	2	2	3	3
2	3	2	2	2	3	2	2	2	2	3	3	2	2	3	2	2	2	2	2	2	2	2	2	2	3	3	2	2	2	3	3	2	2	3	3
3	2	3	4	2	2	2	2	2	2	2	3	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	3	3	2	2	3	4	3		
4	3	4	3	2	2	2	2	2	2	2	3	2	2	3	2	2	2	2	2	2	3	3	2	2	2	2	3	3	2	2	3	3	2	3	
5	3	4	4	3	3	2	2	2	2	3	3	2	2	3	2	2	2	2	2	2	2	2	2	3	2	3	4	3	2	2	4	4	3	2	3
6	3	3	3	3	3	2	3	3	2	2	3	2	2	3	2	1	2	3	3	2	2	2	2	3	3	3	3	3	3	4	3	2	2		
7	2	2	2	3	3	3	4	4	2	2	3	2	2	2	3	3	4	3	3	2	2	2	2	3	2	3	3	3	2	3	3	4	4	3	2
8	2	2	2	2	4	4	4	3	3	3	3	2	2	2	4	2	3	4	3	2	2	2	2	2	2	2	3	2	2	2	3	3	2	2	1
9	3	2	2	2	3	4	2	2	2	2	3	2	3	3	3	2	3	2	3	3	2	3	2	3	3	2	2	2	2	2	2	3	2	2	2
10	2	2	3	3	3	3	2	2	3	2	2	3	2	3	3	2	2	2	3	4	3	3	3	3	3	2	2	2	3	2	3	3	3	2	1
11	2	4	4	3	3	2	3	2	4	3	2	2	2	2	2	3	3	3	4	4	4	3	4	3	3	2	2	2	3	3	3	2	3	2	2
12	3	4	2	2	2	2	3	3	3	2	2	2	2	2	2	3	3	3	4	4	4	3	4	3	3	2	2	2	3	3	2	2	2	1	2
13	4	4	3	2	3	3	3	3	2	2	2	2	3	2	2	2	3	3	2	3	4	3	3	4	2	2	3	3	3	3	3	2	2	2	2
14	4	3	4	4	4	3	3	3	3	3	3	4	4	3	2	2	3	2	2	3	4	3	3	4	2	2	3	3	3	4	3	2	1	2	1
15	3	2	4	4	3	2	2	3	3	4	3	3	4	3	2	3	3	3	3	4	4	4	3	2	1	2	3	3	3	3	3	3	1	2	
16	2	3	4	4	3	3	3	3	2	2	2	3	2	2	2	3	4	4	4	4	3	3	3	2	2	3	4	2	2	3	3	4	3	3	3
17	3	4	4	4	4	4	2	2	1	1	2	1	1	2	2	3	4	4	4	4	3	3	3	2	1	2	3	2	2	2	2	2	3	4	3
18	3	4	3	4	4	3	1	1	1	1	2	2	2	2	3	3	4	4	3	4	2	2	3	2	2	1	2	2	2	2	2	1	3	3	2
19	3	3	3	3	3	2	2	1	1	2	2	2	1	2	2	2	3	3	2	2	2	2	3	2	2	2	1	1	1	1	2	2	2	3	2
20	2	2	2	2	2	2	1	1	2	1	3	2	2	2	1	2	3	2	2	2	1	2	3	2	1	1	2	2	2	1	1	2	3	4	4
21	2	2	1	2	2	2	1	1	2	2	3	4	4	4	2	3	2	2	2	3	2	2	2	3	3	2	2	2	1	2	1	2	3	2	3
22	2	2	1	2	2	1	1	2	2	3	4	4	3	3	2	3	2	2	3	4	4	3	3	3	3	2	2	1	1	2	1	1	2	2	2
23	2	2	2	2	2	1	1	2	2	2	2	3	3	3	4	3	2	3	4	4	3	3	4	2	2	3	3	1	1	2	2	1	2	2	4
24	2	2	2	2	2	1	3	4	3	2	2	3	4	4	4	3	3	3	3	2	2	3	4	3	3	4	3	2	1	3	2	3	2	3	4
25	2	2	1	1	2	1	1	4	3	3	2	3	4	4	4	4	4	1	2	1	1	2	2	3	3	3	3	2	2	3	4	3	3	4	3
26	1	1	1	1	1	1	2	1	3	4	4	3	4	3	4	4	4	3	1	2	1	1	3	3	3	3	4	3	3	3	3	3	3	3	2
27	1	1	1	1	1	1	2	1	3	3	3	3	3	3	4	4	3	3	1	2	1	2	2	3	3	3	4	3	2	1	2	2	3	3	3
28	1	1	1	1	1	2	2	2	3	3	2	2	1	3	4	3	3	3	3	3	3	3	4	3	1	3	2	1	1	2	3	4	3	2	
29	1	1	1	2	2	3	2	2	2	2	2	2	1	3	3	1	1	3	2	3	3	4	3	3	3	2	3	3	3	2	2	2	3	3	3
30	2	3	4	3	3	5	3	4	2	2	2	2	1	1	3	3	1	2	1	3	3	4	3	2	1	1	1	2	1	2	1	2	2	3	3
31	2	3	4	4	4	5	4	4	2	2	1	1	1	2	2	2	1	2	2	3	4	3	3	1	2	2	1	2	2	2	1	2	2	3	1
32	2	3	4	4	2	5	3	3	2	2	2	2	2	3	2	2	3	2	2	3	4	2	2	2	1	2	1	2	2	2	2	3	3	2	2
33	2	3	3	3	2	2	3	3	4	3	2	2	3	3	2	3	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2
34	3	4	3	3	2	2	2	2	3	3	3	3	4	4	4	4	2	2	3	2	3	2	1	1	1	2	1	1	1	2	2	2	2	4	4
35	2	3	2	2	2	2	1	2	2	3	4	4	4	4	4	3	2	2	1	1	3	3	3	2	1	2	1	1	1	1	3	3	3	4	4
36	3	2	2	2	2	2	1	1	2	3	3	3	3	4	4	3	2	2	1	2	2	2	2	2	2	1	1	1	1	1	3	3	3	3	3
37	2	2	2	3	3	2	2	2	2	2	3	2	3	4	3	3	4	4	3	3	3	1	2	1	1	1	1	1	2	2	1	2	1	1	2
38	2	3	4	4	4	2	2	3	3	3	4	3	3	2	2	2	3	3	4	3	3	2	2	2	2	1	1	2	3	3	2	2	1	3	3
39	4	4	4	4	3	2	2	2	3	2	2	4	3	3	3	2	2	3	4	4	4	2	2	1	3	3	3	2	3	3	2	3	2	3	2

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ORIGIN 454[illegible]0 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS [illegible] BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

Y OFFSET	X OFFSET 74									79
0	3	2	2	3	3	4	4	4	4	5
1	1	2	2	3	3	3	4	4	4	4
2	2	2	2	2	2	3	3	4	4	3
3	2	2	2	3	3	3	3	3	2	2
4	2	2	3	3	3	3	3	2	2	2
5	2	2	3	2	3	2	2	2	2	3
6	2	2	2	2	2	3	2	2	4	3
7	2	2	2	2	2	2	3	3	4	3
8	2	2	2	2	3	4	4	4	4	4
9	2	2	2	2	2	3	4	4	4	4
10	2	2	2	2	2	3	4	3	3	4
11	2	3	2	1	2	3	4	3	2	3
12	2	4	3	3	3	3	4	3	3	4
13	2	4	4	4	4	4	4	4	4	3
14	3	4	3	4	3	4	4	4	4	4
15	3	4	3	2	2	2	2	3	4	4
16	4	4	4	2	2	2	3	3	4	4
17	4	4	4	4	4	3	3	2	3	4
18	3	4	4	3	3	2	2	2	2	3
19	2	4	3	2	3	2	2	2	1	2
20	1	3	1	2	3	3	4	4	3	2
21	2	3	3	2	3	4	3	4	4	4
22	2	3	4	4	4	4	3	3	2	3
23	4	3	4	4	4	4	4	3	4	3
24	3	2	3	3	4	3	4	4	4	4
25	3	3	2	3	2	3	3	4	3	3
26	2	3	3	3	2	2	3	4	4	3
27	2	2	3	4	2	2	2	4	3	2
28	2	3	4	3	3	4	3	3	3	3
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31	2	3	3	3	2	2	3	2	2	2
32	3	4	4	3	3	4	3	2	4	3
33	3	4	2	2	3	4	4	2	2	3
34	4	3	3	2	2	3	3	2	3	3
35	4	3	3	3	3	2	2	3	3	3
36	2	3	3	4	3	2	2	3	3	3
37	2	3	3	3	2	2	2	2	2	4
38	2	3	4	3	3	3	3	3	3	4
39	2	2	3	3	3	3	2	3	4	4

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ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

X OFFSET

Y OFFSET	4	9	14	19	24	29	34
0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	9 37 28 12 37 28	18 12 9 16 25 25	3 16 12
1	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	25 37 16 6 6 6	12 9 9 16 9 25	6 18 0
2	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 37 3 6 25 6	6 6 0 18 18 18	0 12 12
3	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 37 3 3 3 16	18 12 12 18 18 18	9 18
4	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	3 25 37 6 9 28	6 18 0 18 25 12	12 12 12
5	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	25 12 37 9 18 37	18 9 9 18 25 0	25 0 9
6	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	18 3 6 37 18 18	9 0 25 37 18 28	25 28 37
7	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	28 18 25 37 18 6	25 28 28 18 37 28	28 37 37
8	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	37 37 28 28 28 6	25 0 12 12 18 18	18 28 9
9	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	37 37 37 18 37 3	0 18 3 25 0 18	18 25 9
10	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	37 37 28 0 37 9	0 9 18 18 18 12	12 25 25
11	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	37 28 25 12 37 28	9 18 37 37 28 25	25 12 18
12	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	37 37 25 25 37 18	28 37 37 37 37 28	25 3 3
13	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	37 37 28 9 25 37	18 18 18 9 12 18	9 0 37
14	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	28 3 6 6 37 18	18 18 9 18 18 18	18 16 37
15	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	25 28 6 6 37 9	9 28 28 25 3 0	25 18 18
16	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	12 18 6 9 25 37	18 37 28 0 25 16	18 18 6
17	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	37 28 6 12 12 37	28 37 37 37 18 18	25 6 6
18	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	28 18 18 9 12 0	37 37 18 28 18 6	12 25 6
19	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	25 9 28 9 12 0	25 37 12 18 18 0	0 25 12
20	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	18 0 18 18 0 25	3 37 37 37 18 3	0 12 12
21	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	12 18 37 28 28 18	28 37 18 28 37 0	3 0 6
22	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	18 6 37 25 9 28	37 37 12 18 37 28	6 6 25
23	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	28 9 9 25 18 18	28 37 3 28 37 37	6 18 6
24	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	28 37 37 18 37 6	0 6 37 9 28 37	6 6 25
25	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	6 37 18 25 18 12	0 6 12 37 28 37	28 6 6
26	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	6 28 9 25 9 18	0 6 9 37 37 37	18 12 12
27	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	9 37 25 25 18 37	28 37 37 28 37 37	18 18 0
28	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	37 28 37 18 9 18	37 28 37 37 37 37	25 28 9
29	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	18 18 37 9 25 25	37 18 37 37 37 37	25 9 12
30	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	18 28 9 18 25 9	6 9 37 9 37 37	18 18 9
31	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	9 18 9 12 28 18	9 9 18 9 37 9	25 6 25
32	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	37 37 37 9 25 25	3 9 18 37 18 25	25 0 0
33	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	28 37 37 28 25 0	25 0 28 28 28 25	25 3 0
34	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	25 18 37 37 16 6	0 37 12 28 28 6	25 25 12
35	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 9 28 28 25 3	37 6 6 28 28 18	18 25 9
36	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	12 12 12 3 12 37	25 18 12 25 37 37	37 37 37
37	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	12 18 6 25 25 28	25 18 25 25 28 37	37 28 25
38	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 6 12 9 25 0	25 0 25 12 25 37	37 28 25
39	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	28 18 18 12 25 9	25 28 28 37 28 37	37 28 28

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ORIGIN = 454000 6022000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 50 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

Y OFFSET	X OFFSET 39					44					49					54					59					64					69
0	0	9	3	18	25	6	0	25	18	37	18	12	25	25	12	9	12	6	0	18	6	6	6	6	25	18	18	25	6	12	0	18	18	28	37
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2	18	3	25	25	25	9	0	3	6	18	28	9	25	18	0	25	12	9	0	0	12	12	0	18	9	0	25	9	37	37	6	18	18	18	28
3	6	28	37	6	9	0	0	0	12	6	28	6	25	6	18	12	0	9	0	6	6	0	6	25	12	6	6	28	28	18	0	37	28	37	9
4	9	28	28	3	9	3	25	25	6	6	28	3	25	18	9	0	18	6	6	6	9	9	3	0	6	12	28	18	6	25	28	18	37	28	18
5	18	37	37	25	28	25	6	25	12	18	37	3	25	28	9	25	3	9	9	0	9	6	25	18	25	18	37	18	18	9	28	28	9	6	37
6	28	28	18	28	9	12	18	18	12	18	28	0	25	9	6	0	9	18	18	0	3	25	25	25	18	28	28	18	18	37	37	37	28	0	37
7	9	0	18	18	28	18	37	37	12	0	18	0	25	9	37	28	37	28	28	12	25	0	25	18	0	9	28	25	0	25	28	37	37	9	0
8	25	0	37	18	37	37	37	18	37	28	28	0	25	0	37	9	28	37	28	3	25	12	12	6	3	6	28	9	25	25	28	18	12	0	0
9	25	6	18	12	28	37	12	6	0	0	18	9	25	28	28	3	18	6	37	18	25	9	0	9	18	9	25	0	0	25	9	28	6	6	0
10	25	25	28	28	28	28	6	6	9	25	12	9	25	18	18	25	12	6	28	37	28	28	25	28	37	0	37	0	9	25	18	28	28	25	0
11	18	37	37	28	12	6	28	6	37	25	3	0	25	0	0	25	28	28	37	37	37	37	37	37	37	18	25	12	18	28	37	0	18	25	0
12	18	37	18	6	18	0	28	18	25	18	3	3	6	25	25	9	18	28	37	37	37	37	37	37	25	25	9	25	18	28	18	37	25	0	12
13	37	37	18	18	18	18	28	18	6	0	3	9	28	37	12	6	18	18	25	28	37	37	37	37	6	25	28	28	28	37	25	37	12	12	12
14	37	28	37	37	37	18	25	28	25	28	28	37	37	28	18	9	18	6	12	28	37	37	28	37	6	25	18	28	28	37	12	37	0	0	6
15	18	25	37	37	9	6	25	28	28	37	28	28	37	28	25	28	37	28	18	28	37	37	37	25	0	25	28	25	25	37	37	28	28	25	6
16	6	6	37	37	28	18	28	18	12	37	18	18	9	9	3	28	37	37	37	37	28	37	18	25	12	25	37	18	25	28	28	37	37	28	25
17	18	37	37	37	37	37	25	6	18	12	12	0	6	9	25	28	37	37	37	37	25	18	9	3	25	9	28	0	25	37	0	12	28	37	28
18	28	37	37	37	37	28	6	25	28	0	12	0	18	18	18	18	37	37	28	37	12	18	9	0	25	9	9	0	25	37	25	0	28	28	12
19	28	28	18	28	28	25	0	37	3	0	9	9	6	6	6	25	28	18	0	12	12	12	18	18	25	25	6	6	6	37	25	6	6	12	6
20	3	3	12	6	3	6	25	50	0	25	28	9	18	25	25	9	18	0	25	3	0	6	9	0	25	6	25	25	0	0	37	0	37	37	37
21	6	0	25	0	6	18	37	37	12	9	28	28	37	37	25	12	12	12	6	12	12	12	25	28	25	0	25	18	0	0	37	0	26	12	18
22	6	6	0	25	6	25	37	12	12	18	37	37	28	25	9	18	6	0	28	37	37	18	18	28	25	6	3	0	25	28	9	0	0	12	12
23	0	0	6	0	3	37	0	6	25	6	6	28	28	28	37	28	9	19	37	37	18	28	28	37	25	18	18	0	0	37	18	0	18	9	37
24	18	0	18	0	6	37	18	37	18	18	25	28	37	37	37	28	28	37	18	12	0	18	37	25	18	37	28	18	18	28	12	12	0	28	37
25	25	0	12	12	6	37	25	37	28	28	25	28	37	37	37	37	37	12	12	3	3	3	37	18	18	37	28	12	37	28	37	28	28	37	28
26	6	25	25	25	28	25	0	25	28	37	37	37	37	37	37	37	37	37	12	0	6	0	37	28	18	12	37	28	18	28	28	28	28	25
27	18	18	25	37	25	6	6	25	18	28	28	28	28	37	37	37	18	18	6	6	6	0	37	18	28	28	37	18	12	37	25	12	18	18	18
28	37	12	12	25	37	0	0	6	18	9	6	3	0	37	37	18	18	9	18	25	9	18	37	37	37	25	37	0	0	37	6	18	37	28	9
29	37	12	0	6	37	18	0	6	12	12	0	18	6	18	18	12	12	18	12	18	28	37	28	37	18	0	28	18	9	12	37	12	28	28	9
30	0	18	28	18	18	37	28	37	25	12	0	9	0	3	18	18	0	6	25	12	28	37	28	3	18	25	0	12	0	0	37	6	6	18	18
31	0	28	37	28	18	37	37	37	25	9	25	25	0	25	9	9	9	0	25	18	37	28	18	12	6	37	18	25	0	12	28	0	18	0	25
32	12	18	37	37	6	37	28	18	9	6	12	25	12	9	3	6	9	0	0	25	37	9	12	12	12	12	37	6	28	18	0	18	18	6	25
33	25	28	28	18	3	37	28	18	37	28	25	3	28	28	9	18	0	12	12	25	9	0	12	3	6	0	0	25	37	12	12	12	25	12	12
34	28	37	28	18	3	6	25	0	18	25	28	28	37	37	37	37	6	12	28	6	18	6	0	0	0	6	12	37	25	0	3	9	9	37	28
35	12	18	9	0	0	0	37	6	6	28	37	37	37	37	37	28	12	25	0	6	9	25	18	0	0	12	6	37	25	12	18	28	28	37	37
36	18	0	6	6	0	6	37	0	0	9	28	28	18	37	37	28	25	18	9	0	12	25	18	3	0	6	37	37	25	9	37	28	28	28	18
37	9	0	0	12	18	0	37	9	9	12	9	6	18	37	28	25	37	37	28	18	18	6	37	18	28	28	28	6	0	6	0	6	12	12
38	12	28	28	37	37	9	37	18	18	28	37	18	18	9	12	6	28	28	37	37	28	25	37	3	6	25	0	0	9	12	12	25	6	28	9
39	28	37	37	37	28	0	37	9	12	9	9	37	18	28	18	6	12	18	37	37	37	18	37	28	25	25	9	0	9	18	6	9	9	28	25

ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

Y OFFSET	X OFFSET 74									79
0	18	9	9	28	37	37	37	37	37	37
1	12	18	18	28	37	18	37	37	37	37
2	0	0	37	9	12	18	37	28	28	9
3	18	9	37	28	37	28	28	18	12	25
4	0	6	37	18	37	25	28	6	12	12
5	9	0	37	0	18	12	25	25	12	18
6	0	9	12	37	0	9	28	9	28	18
7	18	18	18	18	18	12	12	28	37	37
8	9	6	12	12	25	28	28	37	37	37
9	9	0	25	18	6	18	37	37	37	37
10	0	18	0	0	0	28	37	28	18	37
11	0	28	25	6	25	18	37	9	25	28
12	9	37	28	37	28	25	37	25	18	37
13	6	37	37	37	37	37	28	37	37	28
14	18	37	28	37	28	37	25	37	37	37
15	28	37	37	12	6	6	25	28	37	37
16	28	37	37	6	3	12	9	25	37	37
17	37	37	37	37	37	28	25	6	25	37
18	18	37	37	37	28	25	9	6	25	9
19	12	37	18	9	18	9	9	12	12	37
20	12	25	6	6	6	25	37	37	18	6
21	25	18	18	12	9	37	28	37	37	37
22	6	18	37	37	37	28	18	18	12	12
23	37	18	37	37	37	37	37	37	37	28
24	37	12	9	37	37	28	37	37	37	37
25	28	18	25	9	25	18	28	37	28	18
26	6	9	25	12	25	25	25	37	37	12
27	25	6	18	28	12	12	0	37	28	12
28	25	18	37	12	25	37	28	28	37	18
29	25	6	28	18	9	28	6	18	28	28
30	25	6	9	18	25	18	9	12	18	6
31	12	9	25	28	9	9	9	12	25	9
32	18	37	18	28	18	37	28	12	28	28
33	25	37	25	18	25	28	28	25	18	18
34	37	28	28	9	12	9	18	9	18	18
35	37	37	28	18	12	12	12	28	28	18
36	18	18	28	37	12	18	6	28	25	18
37	12	12	37	37	0	6	12	12	25	37
38	6	9	37	18	12	12	9	18	18	25
39	0	6	12	28	18	18	9	25	28	28

TERRAIN
BASE ALTITUDES
(METERS)

ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 40 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

Y OFFSET	X OFFSET 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
1	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
2	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
3	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
4	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
5	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
6	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
7	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
8	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
9	230	230	230	230	230	230	230	230	230	250	250	250	250	250	250	250	250	250	250	280	280	280	280	280	280
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TERR
BASE ALT. ES
(METERS)

ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

Y OFFSET	X OFFSET 29					34					39					44					49				
0	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	280	280	280	280	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TERRAIN
BASE ALTITUDES
(METERS)

REPORT D2-L
PAGE 9

ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

Y OFFSET	X OFFSET 54					59					64					69					74				
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TERRAIN
BASE ALTITUDES
(METERS)

REPORT D2-C
PAGE 10

ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

X OFFSET

Y OFFSET					79
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
31	0	0	0	0	0
32	0	0	0	0	0
33	0	0	0	0	0
34	0	0	0	0	0
35	0	0	0	0	0
36	0	0	0	0	0
37	0	0	0	0	0
38	0	0	0	0	0
39	0	0	0	0	0

ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

ID	COORDINATE OF CENTER X	Y	PEAK HEIGHT (METERS)	ANGLE (DEGREES)	ECCENTRICITY	SPREAD (METERS)	HEIGHT OF NORMAL CURVE (METERS)	CUT (METERS)
1	461300	607100	405	145	3.00	1000	155	155.00
2	460100	608000	375	115	2.00	700	125	125.00
3	460700	608300	355	105	2.00	700	105	105.00
4	461200	608400	345	70	3.00	800	95	73.61
5	461400	607800	365	72	3.00	800	115	70.38
6	462600	607800	375	120	2.00	1200	125	92.52
7	462600	607800	375	78	2.00	1200	125	125.00
8	462700	607500	365	105	2.00	1200	135	94.47
9	463300	607400	365	355	3.00	700	115	74.48
10	464000	609900	371	65	2.00	800	121	121.00
11	463800	610300	345	130	2.00	400	95	75.75
12	463500	611800	295	340	2.00	500	51	51.00
13	462000	611800	395	75	2.00	600	145	77.73
14	461700	611300	421	0	1.00	350	171	141.61
15	461700	611300	410	65	2.00	700	160	115.06
16	461700	611900	375	155	2.00	400	125	98.31
17	462300	611800	385	345	2.00	400	135	135.00
18	461500	611500	395	195	2.00	400	145	82.06
19	460700	611100	415	155	2.00	900	165	161.62
20	462000	611300	395	0	2.00	400	145	145.00
21	460900	611200	385	90	2.00	300	135	10.00
22	460100	611500	385	135	3.00	700	135	87.26
23	460100	611500	385	90	3.00	700	135	69.10
24	459700	610600	365	180	2.00	700	115	115.00
25	459700	610600	365	260	3.00	600	115	115.00
26	459700	610400	365	0	1.00	450	115	115.00
27	460600	610700	395	270	3.00	750	145	141.21
28	460500	610300	375	270	2.00	500	125	125.00
29	461000	610500	395	270	3.00	800	145	128.28
30	460900	609900	355	240	2.00	500	105	82.06
31	461400	610500	395	305	4.00	900	145	103.21
32	461800	610200	375	31	3.00	700	125	125.00
33	462200	610500	345	45	4.00	350	95	20.91
34	462200	609600	355	0	3.00	1000	105	92.90
35	462800	609700	335	60	4.00	1000	85	85.00
36	463100	610100	325	60	3.00	350	75	28.06
37	457600	607600	365	52	3.00	800	115	115.00
38	457800	607700	365	0	3.00	800	115	115.00
39	457500	608000	355	145	2.00	750	105	105.00
40	457000	608300	325	170	2.00	300	75	19.35
41	457000	607500	345	130	2.00	300	95	67.02
42	458200	607700	355	110	2.00	550	105	80.18
43	458500	607100	365	23	3.00	600	115	102.13
44	458200	608900	361	0	1.00	500	111	111.00

ORIGIN 454000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

OFFSET X	OFFSET Y	ID NUMBERS OF HILLS APPEARING IN GRID X,Y
0	0	113 114 111 115 118 76
0	1	114 116 115 110 117 118 112
0	2	112 97 114 98
0	3	97 102 98
0	4	102 103 93 104
0	5	38 62 70 71 102 63 93 69
0	6	62 66 70 63 68 69
0	7	63 64 62 66 65
0	8	61 64 60 62 63
0	9	60 58
0	10	NONE
0	11	NONE
0	12	NONE
0	13	NONE
0	14	NONE
0	15	NONE
0	16	NONE
0	17	NONE
0	18	NONE
0	19	NONE
0	20	NONE
0	21	NONE
0	22	NONE
0	23	NONE
0	24	NONE
0	25	NONE
0	26	NONE
0	27	NONE
0	28	NONE
0	29	NONE
0	30	NONE
0	31	NONE
0	32	NONE
0	33	NONE
0	34	NONE
0	35	NONE
0	36	NONE
0	37	NONE
0	38	NONE
0	39	NONE
2	0	83 76 74 77 80
2	1	80 76 117 77 81 124
2	2	99 80 124 97 117 100 98

OFFSET X	OFFSET Y	ID NUMBERS OF HILLS APPEARING IN GRID X,Y
1	0	76 110 79 83 80 118 117
1	1	117 116 76 118 114 112 97
1	2	97 117 93 98 112
1	3	94 93 102 98 97 103 99
1	4	104 93 108 94 102 109 105 106 107
1	5	36 93 104 69
1	6	69 39 66 68 38
1	7	66 62 39 47 67 65
1	8	47 52 62 50
1	9	58 52 53 54
1	10	NONE
1	11	NONE
1	12	NONE
1	13	NONE
1	14	NONE
1	15	NONE
1	16	NONE
1	17	NONE
1	18	NONE
1	19	NONE
1	20	NONE
1	21	NONE
1	22	NONE
1	23	NONE
1	24	NONE
1	25	NONE
1	26	NONE
1	27	NONE
1	28	NONE
1	29	NONE
1	30	NONE
1	31	NONE
1	32	NONE
1	33	NONE
1	34	NONE
1	35	NONE
1	36	NONE
1	37	NONE
1	38	NONE
1	39	NONE
3	0	75 76 74 78 77 83
3	1	80 78 81 79 77 76 75
3	2	80 124 82 99

ORIGIN = 600000 602000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

COORDINATE OF GRID SQUARE = ORIGIN + (OFFSET * GRID SIZE)

OFFSET X	OFFSET Y	---ID NUMBERS OF HILLS APPEARING IN GRID X,Y---
2	3	98 84 99 94 124 101
2	4	37 94 104 84 92 91 153
2	5	38 91 41 37 39 104 153
2	6	39 38 45 40
2	7	39 47 45
2	8	47 50 52 49 51
2	9	52 58 50 53 49
2	10	NONE
2	11	NONE
2	12	NONE
2	13	NONE
2	14	NONE
2	15	NONE
2	16	NONE
2	17	NONE
2	18	NONE
2	19	NONE
2	20	NONE
2	21	NONE
2	22	NONE
2	23	NONE
2	24	NONE
2	25	NONE
2	26	NONE
2	27	NONE
2	28	NONE
2	29	NONE
2	30	NONE
2	31	NONE
2	32	NONE
2	33	NONE
2	34	NONE
2	35	NONE
2	36	NONE
2	37	NONE
2	38	NONE
2	39	NONE
4	0	72 75 76
4	1	122 72 80 79 73 75 123
4	2	124 80 122 123
4	3	84 124 87
4	4	87 89 153 43 90 84
4	5	38 43 42 153 37
4	6	44 38 37 42
4	7	44 46 55 26 45 59

OFFSET X	OFFSET Y	---ID NUMBERS OF HILLS APPEARING IN GRID X,Y---
3	3	85 84 124 98
3	4	91 43 84 89 92 85 90 153
3	5	91 38 37 39 43 41 153 42
3	6	39 45 44 37 40
3	7	45 46 55 47 44
3	8	55 47 59 49
3	9	56 57 49 50 56 59 55
3	10	NONE
3	11	NONE
3	12	NONE
3	13	NONE
3	14	NONE
3	15	NONE
3	16	NONE
3	17	NONE
3	18	NONE
3	19	NONE
3	20	NONE
3	21	NONE
3	22	NONE
3	23	NONE
3	24	NONE
3	25	NONE
3	26	NONE
3	27	NONE
3	28	NONE
3	29	NONE
3	30	NONE
3	31	NONE
3	32	NONE
3	33	NONE
3	34	NONE
3	35	NONE
3	36	NONE
3	37	NONE
3	38	NONE
3	39	NONE
5	0	72 119 120
5	1	122 120 119 72
5	2	124 122 120
5	3	124 150 151 148 147 87 152
5	4	153 152 151 87 150 144
5	5	153 2 154 38 1
5	6	2 44 1 38
5	7	26 2 44 25

ORIGIN 454000 502000
SIZE OF GRID SQUARE = 1000 METERS
MAP IS 80 BY 40 GRID SQUARES

ID	COORDINATE OF CENTER X	Y	HEIGHT (METERS)	ANGLE (METERS)	MAJOR AXIS (METERS)	MINOR AXIS (METERS)

NO COVER ELLIPSES

TERRAIN
COVER SUMMARY

[illegible] 60,000
[illegible] SQUARE = 1000 METERS
MAP [illegible] 40 GRID SQUARES

COORDINATE OF GRID SQUARE = GRID ORIGIN + (OFFSET * GRID SIZE)

OFFSET X	OFFSET Y	ID NUMBERS OF COVERS APPEARING IN GRID X,Y

NO COVERS WERE INPUT

EQUIPMENT
DAMAGE CLASS

REPORT D3-A
PAGE 1

CLASS	VALUE	CLASS	VALUE
1	10	6	10
2	10	7	10
3	10	8	10
4	10	9	10
5	10	10	10

BLUE

NAME	CLASS	DAMAGE CLASS	MTBF (HOURS)	MTTR (HOURS)	RANGE (METERS)	JAMMING AWARENESS
RADIO.1	RADIO	1	6	2	20000	YES
RADIO.2	RADIO	1	6	2	20000	YES
RADIO.3	RADIO	1	6	2	20000	YES

EQUIP
EW EQUIPMENT

REPORT 03-C
PAGE [illegible]

[illegible]	[illegible]	DAMAGE CLASS	[illegible]	[illegible]	RANGE (METERS)	OF TIME (SEC)	INTEL RATE	HIGH FREQ (MHZ)	LOW FREQ (MHZ)	RADAR DURATION (MIN)	RADAR INTERVAL (MIN)	EXPENDABLE JAMMERS PROB - SAFE ARRIVAL	EXPENDABLE JAMMERS PROB - ARRIVE ON TARGET
[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	0	[illegible]	35	15	[illegible]	0	0	0
[illegible]	[illegible]	[illegible]	8	1	[illegible]	0	0	25	[illegible]	0	0	0	0
[illegible]	RADAR	[illegible]	[illegible]	2	20000	0	10	4000	3000	[illegible]	30	0	0

RED

NAME	COMBAT VALUE	DAMAGE CLASS	RANGE (METERS)	ATTRITION CLASS	TERRAIN EFFECT
[illegible]	[illegible]	[illegible]	1000	HEAVY	YES
[illegible]	[illegible]	[illegible]	[illegible]	HEAVY	YES

BLUE

EQUIPMENT
TYPE AIR SORTIES

NAME	CLASS	GROUND COORDINATION	TRANSIT TIME (MIN)	LOITER TIME (MIN)	EFFEC-TIVENESS	TRANSIT ATTRITION	LOITER ATTRITION	RENEWAL TIME (MIN)
AAH	ROTARY	YES	30	20	40	0	0	300
TAC.AIR.1	ROTARY	YES	45	20	60	0	0	600

TYPE UNITS
ATTRIBUTE VALUES

REPORT D4-A
PAGE 1

BLUE KEY

A = ALTERNATE CP
B = MOVE RATE (METERS / MINUTE)
C = RADIUS (METERS)
D = INTELLIGENCE FADE RATE
E = MAX ENCRYPTION CAPABILITY
F = ENCRYPTION FACTOR
G = SUPPRESSION FACTOR
H = DURATION OF SUPPRESSION (MIN)
I = ARTY DURATION (MIN)
J = ARTY INTERVAL (MIN)
K = COMM SETUP TIME (MIN)
L = COMM TEARDOWN TIME (MIN)
M = EW SETUP TIME (MIN)
N = EW TEARDOWN TIME (MIN)
O = TACTICAL SETUP TIME (MIN)
P = TACTICAL TEARDOWN TIME (MIN)
Q = EW PRIORITY
R = IF PRIORITY

NAME	CLASS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
DIVISION.HQ	DIV.HQ	NO	200	200	1	10	10	5	5	20	2	20	15	20	15	30	20	50	30
BRIGADE.HQ	BDE.HQ	NO	200	200	1	10	10	5	5	20	2	20	15	20	15	30	20	50	30
BATTALION.HQ	BN.HQ	NO	200	200	1	10	10	5	5	20	2	20	15	20	15	30	20	50	30
MECH.CO	MANEUVER	NO	200	200	1	10	10	5	5	20	2	20	15	20	15	30	20	50	30
ARMOR.CO	MANEUVER	NO	200	200	1	10	10	5	5	20	2	20	15	20	15	30	20	50	30
FIRE.CONTROL	FDC	NO	200	200	1	10	10	5	5	20	2	20	15	20	15	30	20	50	30
RADAR	EW.UNIT	NO	200	200	1	10	10	5	5	20	2	20	15	20	15	30	20	50	30
HOWITZERS	ARTILLERY	NO	200	200	1	10	10	5	5	20	2	20	15	20	15	30	20	50	30

BLUE

TYPE
EQUIPMENT ..STS

TYPE UNITS	COMMUNICATIONS		EW		WEAPONS	
DIVISION.HQ	RADIO.1	5	JAMMER.1	2	NONE	
	RADIO.2	2	JAMMER.2	1		
BRIGADE.HQ	RADIO.1	3	NONE		NONE	
	RADIO.2	2				
BATTALION.HQ	RADIO.3	2	NONE		NONE	
MECH.CO	RADIO.3	2	NONE		APC.1	17
ARMOR.CO	RADIO.3	2	NONE		TANK.1	17
FIRE.CONTROL	RADIO.3	2	NONE		NONE	
RADAR	RADIO.2	1	RADAR.TYPE.1	1	NONE	
HOWITZERS	RADIO.2	2	NONE		HOWITZERS	18

RED

TYPE UNITS
PERCENT ATTRITION RATES
PER COMBAT DAY

FORCE RATIO RANGES

TYPE UNIT CLASS	ATTRITION CLASS	NON COMBAT	UP TO 1/5:1	1/4:1	1/3:1	1/2:1	1:1	2:1	3:1	4:1	5:1	ABOVE 5:1
HQ	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
CORPS.HQ	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
DIV.HQ	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
BDE.HQ	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
REGT.HQ	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
BN.HQ	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
CO.HQ	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
ALT.CP	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
FDC	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
ARTILLERY	LIGHT	2.40	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36
	HEAVY	2.40	8.30	10.30	12.40	16.60	16.60	16.60	16.60	16.60	16.60	16.60
MANEUVER	LIGHT	5.00	4.20	7.98	10.64	13.32	13.32	13.32	13.32	13.32	13.32	13.32
	HEAVY	3.00	5.60	8.40	11.20	14.00	14.00	14.00	14.00	14.00	14.00	14.00
SUPPORT	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
EW.UNIT	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
COMM.UNIT	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
OTHER	LIGHT	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	HEAVY	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40

WEAPON NAMES
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A APC.1 B = TANK.1 C = HOWITZERS

RED BLUE WEAPONS
---- ---- -------

TYPE UNIT CLASS	A	B	C
HQ	700	687	650
CORPS.HQ	700	687	650
DIV.HQ	700	687	650
BDE.HQ	700	687	650
REGT.HQ	700	687	650
BN.HQ	700	687	650
CO.HQ	700	687	650
ALT.CP'S	700	687	650
FDC	700	687	650
ARTILLERY	1000	934	981
MANEUVER	998	946	903
SUPPORT	700	687	650
EW.UNIT	700	687	650
CEMA.UNIT	700	687	650
OTHER	700	687	650

TYPE UNITS
PERFORMANCE DEGRADATION
SECTOR WIDTHS

CUMULATIVE ATTRITION

TYPE UNIT	MISSION	WIDTH (METERS)	0%	10%	20%	30%	40%	45%	50%	55%	60%	65%	ASE 70% And Above
[illegible]	ATTACK	30	[illegible]	90	[illegible]	80	[illegible]	[illegible]	0	0	0	0	0
	DEFEND	30	[illegible]	100	[illegible]	90	[illegible]	60	50	40	0	0	0
	MOVE	30	[illegible]	[illegible]	90	[illegible]	[illegible]	60	50	40	0	0	0
	WITHDRAW	30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60	50	40	0	0	0
	DELAY	30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60	50	40	0	0	0
CORPS	ATTACK	30	[illegible]	[illegible]	80	60	50	0	0	0	0	0	0
	DEFEND	30	[illegible]	[illegible]	90	80	70	60	50	40	0	0	0
	MOVE	30	[illegible]	[illegible]	90	80	70	60	50	40	0	0	0
	WITHDRAW	30	100	100	90	80	70	60	50	40	0	0	0
	DELAY	30	100	100	90	80	70	60	50	40	0	0	0
DIV.HQ	ATTACK	30	100	90	80	60	50	0	0	0	0	0	0
	DEFEND	30	100	100	90	80	70	60	50	40	0	0	0
	MOVE	30	100	100	90	80	70	60	50	40	0	0	0
	WITHDRAW	30	100	100	90	80	[illegible]	60	50	40	0	0	0
	DELAY	30	100	100	90	80	70	60	50	40	0	0	0
BDE.HQ	ATTACK	30	100	90	80	60	50	0	0	0	0	0	0
	DEFEND	30	100	100	90	80	[illegible]	60	50	40	0	0	0
	MOVE	30	100	100	90	80	70	60	50	40	0	0	0
	WITHDRAW	30	100	100	90	80	70	60	50	40	0	0	0
	DELAY	30	100	100	90	80	70	60	50	40	0	0	0
[illegible]	ATTACK	30	100	90	80	60	50	0	[illegible]	0	0	0	0
	DEFEND	30	100	100	90	80	70	60	50	40	0	0	0
	MOVE	30	100	100	90	80	70	60	50	40	0	0	0
	WITHDRAW	30	100	100	90	80	70	60	50	40	0	0	0
	DELAY	30	100	100	90	80	70	60	50	40	0	0	0
BN.HQ	ATTACK	30	100	90	80	60	50	0	[illegible]	0	0	0	0
	DEFEND	30	100	100	90	80	70	60	[illegible]	40	0	0	0
	MOVE	30	100	100	90	80	70	60	[illegible]	[illegible]	0	0	0
	WITHDRAW	30	100	100	90	80	70	60	[illegible]	[illegible]	0	0	0
	DELAY	30	100	100	90	80	70	60	50	40	0	0	0
CO.HQ	ATTACK	30	100	90	80	60	50	0	0	0	0	0	0
	DEFEND	30	100	100	90	80	70	60	50	40	0	0	0
	MOVE	30	100	100	90	80	70	60	50	40	0	0	0
	WITHDRAW	30	100	100	90	80	70	60	50	40	0	0	0
	DELAY	30	100	100	90	80	70	60	50	40	0	0	0

RED

COMBAT ORGA ATION
UNITS

REPORT D5
PAGE 2

ID	NAME	TYPE UNIT	COORDINATES X	Y	SUPERIOR UNIT ID	SUBORDINATE UNIT IDS		LINK IDS				AIR SORTIES
1	DIV.HQ	DIVISION.HQ	530000	622000	NONE	2	3	70001	70002			NONE
2	REGT.HQ.1	REGIMENT.HQ	520000	637000	1	4	5	50001	50002	70001		NONE
3	REGT.HQ.2	REGIMENT.HQ	520000	617000	1	6	7	60001	60002	70002		NONE
4	BN.HQ.1	BATTALION.HQ	510000	638000	2	8	9	10001	10002	10003	10004	NONE
						16	17	50001				
5	BN.HQ.2	BATTALION.HQ	510000	636000	2	10	11	20001	20002	20003	20004	NONE
						18	19	50002				
6	BN.HQ.3	BATTALION.HQ	510000	618000	3	12	13	30001	30002	30003	30004	NONE
						20	21	60001				
7	BN.HQ.4	BATTALION.HQ	510000	616000	3	14	15	40001	40002	40003	40004	NONE
						22	23	60002				
8	TANK.CO.1	TANK.CO	505000	640000	4	NONE		10001				NONE
9	TANK.CO.2	TANK.CO	505000	638000	4	NONE		10002				NONE
10	TANK.CO.3	TANK.CO	505000	636000	5	NONE		20001				NONE
11	TANK.CO.4	TANK.CO	505000	634000	5	NONE		20002				NONE
12	TANK.CO.5	TANK.CO	505000	620000	6	NONE		30001				NONE
13	TANK.CO.6	TANK.CO	505000	618000	6	NONE		30002				NONE
14	TANK.CO.7	TANK.CO	505000	616000	7	NONE		40001				NONE
15	TANK.CO.8	TANK.CO	505000	614000	7	NONE		40002				NONE
16	MR.CO.1	MR.CO	500000	640000	4	NONE		10003				NONE
17	MR.CO.2	MR.CO	500000	638000	4	NONE		10004				NONE
18	MR.CO.3	MR.CO	500000	636000	5	NONE		20003				NONE
19	MR.CO.4	MR.CO	500000	634000	5	NONE		20004				NONE
20	MR.CO.5	MR.CO	500000	620000	6	NONE		30003				NONE
21	MR.CO.6	MR.CO	500000	618000	6	NONE		30004				NONE
22	MR.CO.7	MR.CO	500000	616000	7	NONE		40003				NONE
23	MR.CO.8	MR.CO	500000	614000	7	NONE		40004				NONE

COMMUNICATIONS ORGANIZATION
NETS AND LINKS

BLUE

KEY
A = DIRECTION
B = DESIRABILITY
C = TIME TO CONVERT (MIN)
D = NUMBER OF CHANNELS
E = CONVERTABILITY
F = SWITCHABILITY
G = JAMMABILITY
H = COMPOUND LINK

NET ID	NET ATTRIBUTES	LINK IDS	A END	B END	A END EQUIPMENT	B END EQUIPMENT	A	B	C	D	E	F	G	H
10000	TYPE = RADIO	10001	5	3	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	MODE = VOICE	10002	6	3	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	SECURITY = CLEAR	10003	7	3	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	USAGE = COMMAND													
	CONTINUOUS CARRIER = NO													
	PRIMARY FREQ (MHZ) = 30													
	SECONDARY FREQ(MHZ) = 31													
20000	TYPE = RADIO	20001	8	4	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	MODE = VOICE	20002	9	4	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	SECURITY = CLEAR	20003	10	4	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	USAGE = COMMAND													
	CONTINUOUS CARRIER = NO													
	PRIMARY FREQ (MHZ) = 32													
	SECONDARY FREQ(MHZ) = 33													
30000	TYPE = RADIO	30001	3	2	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	MODE = VOICE	30002	4	2	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	SECURITY = CLEAR													
	USAGE = COMMAND													
	CONTINUOUS CARRIER = NO													
	PRIMARY FREQ (MHZ) = 34													
	SECONDARY FREQ(MHZ) = 35													
40000	TYPE = RADIO	40001	5	11	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	MODE = VOICE	40002	6	11	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	SECURITY = CLEAR	40003	7	11	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	USAGE = FIRE.DIRECT	40004	8	11	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	CONTINUOUS CARRIER = NO	40005	9	11	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	PRIMARY FREQ (MHZ) = 36	40006	10	11	RADIO.3	RADIO.3	TWO	100	0	1	NO	YES	YES	NO
	SECONDARY FREQ(MHZ) = 37													
50000	TYPE = RADIO	50001	11	13	RADIO.3	RADIO.2	TWO	100	0	1	NO	YES	YES	NO
	MODE = VOICE													
	SECURITY = CLEAR													
	USAGE = FIRE.DIRECT													
	CONTINUOUS CARRIER = NO													
	PRIMARY FREQ (MHZ) = 38													
	SECONDARY FREQ(MHZ) = 39													

COMMUNICATIONS [illegible]NIZATION
COMPOUND [illegible]NKS

RED

NET ID	LINK ID	A END	B END	-----OTHER UNITS-----			

NO COMPOUND LINKS FOR THE RED SIDE

ID	DESTINATION	STIMULUS	MODE	PRECEDENCE	THRESHOLD	LENGTH	INTEL VALUE	ACTION	USAGE	SECURITY	DEADLINE ACTION	MEAN TIME	PROC TIME	DEAD LINE
ORIGIN = HQ														
	THIS TYPE UNIT CLASS HAS NO COMMUNICATIONS ORDERS													
ORIGIN = CORPS.HQ														
	THIS TYPE UNIT CLASS HAS NO COMMUNICATIONS ORDERS													
ORIGIN = DIV.HQ														
1	BDE.HQ	MSG.RECEIPT	VOICE	PRIORITY	0	120	70	SEND 4	COMMAND	CLEAR	MESSENGER	0	1	20
2	BDE.HQ	INFORMATION	VOICE	ROUTINE	20	300	50	NONE	COMMAND	CLEAR	DELETE	0	0	10
3	BDE.HQ	FAILURE.FR	VOICE	IMMEDIATE	0	5	80	WITHDRAW	COMMAND	CLEAR	DELETE	0	0	100
ORIGIN = BDE.HQ														
4	BN.HQ	MSG.RECEIPT	VOICE	PRIORITY	0	120	60	NONE	COMMAND	CLEAR	MESSENGER	0	1	20
5	DIV.HQ	TIME	VOICE	ROUTINE	0	5	20	NONE	COMMAND	CLEAR	DELETE	0	1	10
6	BN.HQ	ATTACK.FR	VOICE	PRIORITY	0	50	90	ATTACK	COMMAND	CLEAR	DELETE	0	1	20
ORIGIN = REGT.HQ														
	THIS TYPE UNIT CLASS HAS NO COMMUNICATIONS ORDERS													
ORIGIN = BN.HQ														
7	MANEUVER	TIME	VOICE	PRIORITY	0	150	40	NONE	COMMAND	CLEAR	DELETE	0	10	10
ORIGIN = CO.HQ														
	THIS TYPE UNIT CLASS HAS NO COMMUNICATIONS ORDERS													

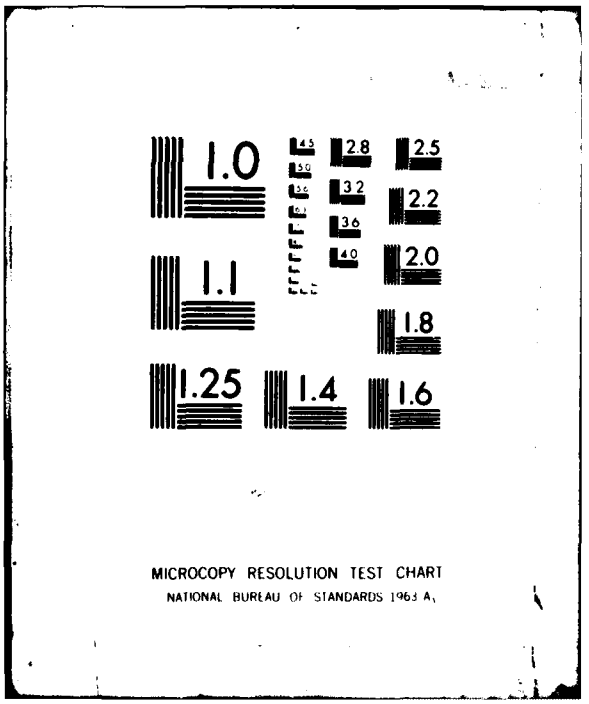
TARGET NET	MIN RANGE (KM)	MAX RANGE (KM)	DURATION (MIN)	FIRST OPTION	SECOND OPTION
COMMAND	0	3	3	BARRAGE.JAM	BARRAGE.JAM
	3	9	1	SPOT.JAM	LOCATE
	9	30	0	INTERCEPT	LOCATE
	30	999	0	INTERCEPT	INTERCEPT

TACTICAL CODES

UNIT	UNIT NAME	ACTIVE TACTIC	TACTICAL MODE	RANGE (METERS)	ATTRITION	DURATION (MIN)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	ATTACK	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			DEFEND	0	[illegible]	0	[illegible]	[illegible]	4.00	1.00	[illegible]	[illegible]
			MOVE	5000	[illegible]		[illegible]	[illegible]	0.	0.	[illegible]	[illegible]
			WITHDRAW	1000	[illegible]	0	[illegible]	[illegible]	4.00	1.00	[illegible]	[illegible]
			DELAY	0	0	0	0	0.	0.	0.	DELAY	DELAY
2	[illegible]	DEFEND	ATTACK	50[illegible]	[illegible]	0	75	0.	1.00	1.00	WITHDRAW	DEFEND
			DEFEND	[illegible]	0	0	60	4.00	1.00	1.00	WITHDRAW	ATTACK
			MOVE	5000	[illegible]	0	80	0.	0.	0.	DEFEND	DEFEND
			WITHDRAW	1000	[illegible]	0	50	4.00	1.00	1.00	DEFEND	DEFEND
			DELAY	0	0	0	0	0.	0.	0.	DELAY	DELAY
3	[illegible]	DEFEND	ATTACK	6000	[illegible]	0	75	0.	1.00	1.00	WITHDRAW	DEFEND
			DEFEND	0	[illegible]	0	60	4.00	1.00	1.00	WITHDRAW	ATTACK
			MOVE	5000	[illegible]	0	80	0.	0.	0.	DEFEND	DEFEND
			WITHDRAW	1000	[illegible]	0	50	4.00	1.00	1.00	DEFEND	DEFEND
			DELAY	0	0	0	0	0.	0.	0.	DELAY	DELAY
4	[illegible]	DEFEND	ATTACK	6000	[illegible]	0	70	4.00	1.00	1.00	WITHDRAW	DEFEND
			DEFEND	0	0	20	60	4.00	1.00	1.00	WITHDRAW	ATTACK
			MOVE	0	0	0	0	0.	0.	0.	MOVE	MOVE
			WITHDRAW	[illegible]	[illegible]	0	50	4.00	1.00	1.00	DEFEND	DEFEND
			DELAY	0	0	0	0	0.	0.	0.	DELAY	DELAY
5	BN.MG.2	DEFEND	ATTACK	6000	270	0	70	4.00	1.00	1.00	WITHDRAW	DEFEND
			DEFEND	0	0	20	60	4.00	1.00	1.00	WITHDRAW	ATTACK
			MOVE	0	0	0	0	0.	0.	0.	MOVE	MOVE
			WITHDRAW	1000	90	0	50	4.00	1.00	1.00	DEFEND	DEFEND
			DELAY	0	0	0	0	0.	0.	0.	DELAY	DELAY
6	[illegible]	DEFEND	ATTACK	[illegible]	270	0	70	4.00	1.00	1.00	WITHDRAW	DEFEND
			DEFEND	0	[illegible]	20	60	4.00	1.00	1.00	WITHDRAW	ATTACK
			MOVE	0	0	0	0	0.	0.	0.	MOVE	MOVE
			WITHDRAW	1000	90	0	50	4.00	1.00	1.00	DEFEND	DEFEND
			DELAY	0	0	0	0	0.	0.	0.	DELAY	DELAY
7	BN.MG.4	DEFEND	ATTACK	6000	270	0	70	4.00	1.00	1.00	WITHDRAW	DEFEND
			DEFEND	0	0	20	60	4.00	1.00	1.00	WITHDRAW	ATTACK
			MOVE	0	0	0	0	0.	0.	0.	MOVE	MOVE
			WITHDRAW	1000	90	0	50	4.00	1.00	1.00	DEFEND	DEFEND
			DELAY	0	0	0	0	0.	0.	0.	DELAY	DELAY

AD-A108 062 CACI INC-FEDERAL ARLINGTON VA F/G 17/4
DIVISIONAL ELECTRONIC WARFARE COMBAT (DEWCOM) MODEL PROGRAMMER --ETC(U)
SEP 80 R T CAMPBELL, R S FAIRBROTHER DAAK21-79-C-0057
UNCLASSIFIED CAA-D-80-7 NL

END
DATE FILMED
1-82
DTIC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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

BLUE

POSTURE	EFFEC-TIVENESS	STRENGTH THRESHOLD	MEAN TIME MULTIPLIER
ATTACK	80	80	50
DEFEND	100	65	25
MOVE	80	90	0
WITHDRAW	80	50	10
DELAY	100	70	0

RED

POSTURE	EFFEC-TIVENESS	STRENGTH THRESHOLD	MEAN TIME MULTIPLIER
ATTACK	80	80	50
DEFEND	100	65	25
MOVE	80	90	0
WITHDRAW	80	50	10
DELAY	100	70	0

APPENDIX E

UNIT STATUS

REPORT M1

SIMULATION TIME = 0. HOURS

PAGE 2

RED

ID	UNIT NAME	TYPE UNIT	COORDINATES X	COORDINATES Y	STRENGTH	FORCE RATIO	ARTY STATUS	ACTIVE TACTICAL ORDER	NUMBER OF UNITS IN CONTACT LIST	NUMBER OF UNITS IN IF TARGET LIST	NUMBER OF MESSAGES IN MESSAGE LIST
1	DIV.HQ	DIVISION.HQ	530000	622000	0	0.	----	DEFEND	0	0	0
2	REGT.HQ.1	REGIMENT.HQ	520000	637000	0	0.	----	DEFEND	0	0	0
3	REGT.HQ.2	REGIMENT.HQ	520000	617000	0	0.	----	DEFEND	0	0	0
4	BN.HQ.1	BATTALION.HQ	510000	638000	0	0.	----	DEFEND	0	0	0
5	BN.HQ.2	BATTALION.HQ	510000	636000	0	0.	----	DEFEND	0	0	0
6	BN.HQ.3	BATTALION.HQ	510000	618000	0	0.	----	DEFEND	0	0	0
7	BN.HQ.4	BATTALION.HQ	510000	616000	0	0.	----	DEFEND	0	0	0
8	TANK.CO.1	TANK.CO	505000	640000	0	0.	----	DEFEND	0	0	0
9	TANK.CO.2	TANK.CO	505000	638000	0	0.	----	DEFEND	0	0	0
10	TANK.CO.3	TANK.CO	505000	636000	0	0.	----	DEFEND	0	0	0
11	TANK.CO.4	TANK.CO	505000	634000	0	0.	----	DEFEND	0	0	0
12	TANK.CO.5	TANK.CO	505000	620000	0	0.	----	DEFEND	0	0	0
13	TANK.CO.6	TANK.CO	505000	618000	0	0.	----	DEFEND	0	0	0
14	TANK.CO.7	TANK.CO	505000	616000	0	0.	----	DEFEND	0	0	0
15	TANK.CO.8	TANK.CO	505000	614000	0	0.	----	DEFEND	0	0	0
16	MR.CO.1	MR.CO	500000	640000	0	0.	----	DEFEND	0	0	0
17	MR.CO.2	MR.CO	500000	638000	0	0.	----	DEFEND	0	0	0
18	MR.CO.3	MR.CO	500000	636000	0	0.	----	DEFEND	0	0	0
19	MR.CO.4	MR.CO	500000	634000	0	0.	----	DEFEND	0	0	0
20	MR.CO.5	MR.CO	500000	620000	0	0.	----	DEFEND	0	0	0
21	MR.CO.6	MR.CO	500000	618000	0	0.	----	DEFEND	0	0	0
22	MR.CO.7	MR.CO	500000	616000	0	0.	----	DEFEND	0	0	0
23	MR.CO.8	MR.CO	500000	614000	0	0.	----	DEFEND	0	0	0

LINK . 5

REPORT M2

PAGE 1

SIMULATION TIME = 0. HOURS

BLUE

NET ID	FREQUENCY IN USE	LINK ID	A END	B END	LINK STATUS	CHANNELS TOTAL	CHANNELS IN USE
10000	30	10001	5	3	IDLE	1	0
		10002	6	3	IDLE	1	0
		10003	7	3	IDLE	1	0
20000	32	20001	8	4	IDLE	1	0
		20002	9	4	IDLE	1	0
		20003	10	4	IDLE	1	0
30000	34	30001	3	2	IDLE	1	0
		30002	4	2	IDLE	1	0
40000	36	40001	5	11	IDLE	1	0
		40002	6	11	IDLE	1	0
		40003	7	11	IDLE	1	0
		40004	8	11	IDLE	1	0
		40005	9	11	IDLE	1	0
		40006	10	11	IDLE	1	0
50000	38	50001	11	13	IDLE	1	0
60000	40	60001	1	2	IDLE	1	0
70000	42	70001	1	12	IDLE	1	0

MESSAGE STATUS

REPORT M3

BLOCK

SIMULATION TIME = 0. HOURS

PAGE 1

DELAY FROM TRAFFIC = 0. MINUTES

ID	NET ID	ORIGINATING UNIT	TRANSMITTING UNIT	DESTINATION	STATUS	USAGE	MODE	LENGTH (SEC)	MIN. TO DEADLINE
5	60000	2	2	1	BEING PROCESSED	COMMAND	VOICE	5	75
7	10000	3	3	5	BEING PROCESSED	COMMAND	VOICE	150	50
7	10000	3	3	6	BEING PROCESSED	COMMAND	VOICE	150	50
7	10000	3	3	7	BEING PROCESSED	COMMAND	VOICE	150	50
7	20000	4	4	8	BEING PROCESSED	COMMAND	VOICE	150	50
7	20000	4	4	9	BEING PROCESSED	COMMAND	VOICE	150	50
7	20000	4	4	10	BEING PROCESSED	COMMAND	VOICE	150	50

BLUE

ATTRITION [illegible]RY

REPORT M4

SIMULATION TIME = 0. HOURS

PAGE 1

EQUIPMENT NAME	ORIGINAL QUANTITY	QUANTITY DESTROYED	QUANTITY REMAINING	% REMAINING	KILLED BY DIRECT FIRE	KILLED BY INDIRECT FIRE	KILLED BY CAS
COMM EQUIPMENT							
RADIO.1	8	0	8	100	0	0	0
RADIO.2	7	0	7	100	0	0	0
RADIO.3	18	0	18	100	0	0	0
EW EQUIPMENT							
JAMMER.1	2	0	2	100	0	0	0
JAMMER.2	1	0	1	100	0	0	0
RADAR.TYPE.1	1	0	1	100	0	0	0
WEAPONS							
APC.1	51	0	51	100	0	0	0
TANK.1	51	0	51	100	0	0	0
HOWITZERS	18	0	18	100	0	0	0
AIR SORTIES							
AAH	10	---	10	100	---	---	---
TAC.AIR.1	2	---	2	100	---	---	---

BLUE

EW STATUS - ACTIONS IN PROGRESS

SIMULATION TIME = 0. HOURS

REPORT M5

PAGE 1

UNIT ID	ACTION	-----RED TARGET UNITS------ ID	ID	ID	ID	ID	UNIT ID	ACTION	-----RED TARGET UNITS------ ID	ID	ID	ID	ID
12	KADAK												

E-6

BLUE

EW STATUS - AWAITING ACTION — REPORT M5

SIMULATION TIME = 0. HOURS — PAGE 3

RED UNITS AWAITING EW ACTION	EQUIPMENT TRIGGERING THE ACTION	PRIORITY	RED UNITS AWAITING EW ACTION	EQUIPMENT TRIGGERING THE ACTION	PRIORITY	RED UNITS AWAITING EW ACTION	EQUIPMENT TRIGGERING THE ACTION	PRIORITY

NO RED TRANSMITTERS AWAITING EW ACTION BY THE BLUE SIDE

EQUIPMENT STATUS - COMMUNICATION ...NT M6

SIMULATION TIME = 0. PAGE 1

BLUE KEY

A = RADIO.1 B = RADIO.2 C = RADIO.3 FORMAT : ORIGINAL QUANTITY / CURRENT

UNIT ID	UNIT NAME	A	B	C
1	DIV.HQ	5/ 5	2/ 2	
2	BDE.HQ	3/ 3	2/ 2	
3	MECH.BN.HQ			2/ 2
4	ARM.BN.HQ			2/ 2
5	MECH.CO.1			2/ 2
6	MECH.CO.2			2/ 2
7	MECH.CO.3			2/ 2
8	ARM.CO.1			2/ 2
9	ARM.CO.2			2/ 2
10	ARM.CO.3			2/ 2
11	FDC.1			2/ 2
12	RADAR.3J		1/ 1	
13	ARTY.FC1		2/ 2	

EQUIPMENT STATUS - BLUE

SIMULATION TIME = 0.

REPORT M6

PAGE 3

A = JAMMER.1 B = JAMMER.2 C = RADAR.TYPE.1 FORMAT : ORIGINAL QUANTITY / CURRENT

BLUE KEY

UNIT ID	UNIT NAME	A	B	C
1	DIV.HQ	2/ 2	1/ 1	
12	RADAR.BN			1/ 1

SIMULATION TIME = 0.

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BLUE

KEY

A = APC.1 B = TANK.1 C = HOWITZER FORMAT = ORIGINAL QUANTITY / CURRENT

UNIT ID	UNIT NAME	A	B	C
5	MECH.CO.1	17/ 17		
6	MECH.CO.2	17/ 17		
7	MECH.CO.3	17/ 17		
8	ARM.CO.1		17/ 17	
9	ARM.CO.2		17/ 17	
10	ARM.CO.3		17/ 17	
13	ARTY.FC1			18/ 18

INTELLIGENCE LOGS REPORT M7

SIMULATION TIME = 0. HOURS PAGE 2

UNIT ID	BLUE UNITS IN THE INTELLIGENCE LOGS													
	ID	VALUE	ID	VALUE	ID	VALUE	ID	VALUE	ID	VALUE	ID	VALUE	ID	VALUE

NO UNIT ON RED SIDE HAS ENTRIES IN ITS INTELLIGENCE LOG


DATE
ILME
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